

PAULINE JOURNAL OF RESEARCH AND STUDIES

ISSN 2347-3843; Volume No.1, Issue No. 3, September 2014

St. Paul's College, Kalamassery, Kochi-683 503, India

paulinejournal@gmail.com

Contents

1	Internationalisation of Indian Higher Education: Exploring the Possibilities Nevil Stephen S	326
2	Resisting Autocratic Regimes for Human Rights: A Study of Poile Sengupta's Play <i>Samara's Song</i> Deepa George	334
3	Mental Maladies and the Pursuit of Happiness: A Critical Analysis of the Treatment of Folk in the Select Novels of Anita Nair. Bini John	346
4	Haunting Fantasy: A Study Based on JK Rowling's Harry Potter Novels M. K. Haider	352
5	Relegated Lives: Mapping the Female Space in Lalithambika Antharjanam's <i>Agnisakshi</i> Jyothisna T. V	358
6	Deconstruction of Sita-Shoorpanaka Binary: Panimalar, a Unique Representation Sanooba Ali	368
7	आदिवासी स्त्री -शाक्तीकरण – नगाडे की तरह बजते शब्दों के द्वारा BeenaP.J.	376
8	Re-entrant Phase Transition in Multi-Component Superconductors Anand Mohan and V. J. Peter	384
9	Preparation and Characterization of Ce-Si-SBA-15 Modified with Chromium- Rose Philo K.J, Eldhose Jacob, Reni George, Sugunan S	392
10	Mechanical Studies of Nano Kaolin Clay Modified, E-Glass Fibre Reinforced Polystyrene / High Density Poly Ethylene Blends Tresa Sunitha George, Asha Krishnan K. and George K. E	404
11	Preparation, Characterisation and thermal studies of composites of polyaniline (doped/undoped forms) with nano magnetite Maria Augustine, Bindu V. U, P. V. Mohanan	414
12	Effect of itaconic acid grafting on the mechanical properties of Polypropylene / Polystyrene / dialkyl silane modified kaolin clay Asha Krishnan. K, Tresa Sunitha George, K.E.George	428
13	Discernible growth of Gold Loan NBFCs in India Justine George and Alphonsa Kurian	438

Internationalisation of Indian Higher Education: Exploring the Possibilities

Nevil Stephen S.

Department of English, St. Paul's College, Kalamassery,
Kochi 683503, India; *nevilstephens@gmail.com*

ABSTRACT

“Internationalisation” is an umbrella term in the global knowledge society that entails diverse factors and target fields which lack homogeneity but rather systematised by the demands of place and time. In other words, in an era marked by successive new revolutions including the burgeoning information and communication technologies, it has hastened yet another phase of global revolution leading to the re-conceptualisation of internationalisation of higher education. In this context, the paper attempts to explore dispassionately the possibilities of stimulating the process of internationalisation of higher education in India without disregarding the threats and perils immanent in it.

Key words: Internationalisation, higher education and employment opportunities

By and large every aspect of the Indian life in the present century undeniably in the urban if not in the rural is fundamentally influenced by the global environment. Fostered especially by means of global connectivity technology, the influence is rapid and dynamic. However, when it comes to the domain of education, the trend gets systematically limited to primary and secondary education sidelining the realm of higher education. Arguably even in schools, the influence of the global environment is singularly restricted within the bounds of introduction of “so called” international textbooks and syllabi, classroom appearance and ambience, and the western emulated uniforms. Unaware of the global trend in the demand and supply, providers and receivers of

employment, international cooperation and collaboration, Indian higher education system remain compellingly unfocused, traditional than experimental.

“Internationalisation” is an umbrella term in the global knowledge society that entails diverse factors and target fields which lack homogeneity but rather systematised by the demands of place and time. Put it differently, in an era marked by the incessant emergence of successive new revolutions, the burgeoning of information and communication technologies have accelerated yet another phase of global revolution leading to the re-conceptualisation of internationalisation of higher education. From a liberal angle it may be identified as a buzzword for academic and social advancement. However, this prioritised area though appear ostensibly beneficial, is not free from multiple predicaments. Falling in these lines, the present paper primarily attempts to locate this alluded issue from three standpoints such as nature and characteristics, objectives and strategies and the challenges implied and faced in the field of internationalisation of higher education.

Nature and Characteristics

Internationalisation, to put it succinctly is a dynamic process of change that envisages production of new knowledge through cooperation beyond borders. It unconditionally aims at contributing towards the human, social, cultural and economic development. It envisions elevating the higher education system globally competitive. In short, as Yoka Tsuruta observes: since the mid 1990s, “Higher education institutions are expected to play a leading role in producing new knowledge, providing quality education and research, serving human well-being and enabling people to face both opportunities and challenges”(140). Some of the other aims that could be teamed up along with the recognised broader outline include the possibility of exploring chances for global collaboration, providing the state of the art education and expertise to link up the global standards, familiarising the international setting and catch on to the global mind-set.

Before moving further, there is a need to differentiate the two terms that are interchangeably used; globalisation and internationalisation. The term “Globalisation” is generally used synonymously with the term “Internationalisation” though they differ etymologically and conceptually. While globalisation is essentially preoccupied with the nation states and their negotiations, internationalisation is a process geared towards globalisation. In other words, globalisation may be described as a process that increases “the flow of people, culture, ideas, values, knowledge, technology and economy across borders, resulting in a more interconnected and interdependent world” (Knight 44). Internationalisation on the other hand may be viewed as a “multifaceted process aimed at integrating an international dimension into the purpose, goals, functions, and delivery of higher education.” (42)

Many European nations, decades earlier entered into the fray of exploring the prospects of internationalising their higher education systems. To cite an example, Sweden engaged in the process of internationalisation of education in the late 1960s. The United States from the beginning continues to be the leading country that has spearheaded many new policies and practices remaining strong till date in the process of internationalisation.

Some of the crucial necessities that compose the creation of the global human work force include; (i) a good command on any foreign language, preferably English; (ii) a mind and spirit to take up challenges and initiatives; (iii) an adequate amount of emotional intelligence to cooperate and collaborate; (iv) a sound sense for intercultural understanding that can control the ethnocentric bearings and (v) a superior functional discipline skill.

Objectives and Strategies

Even though higher education is an unassailable force for globalisation, it remains challenged in serving all the needs of the global reality. Hence a conceptual framework for considering the various variables of higher education is to be drawn based on the exigency of time. One major global reality is the hard

fact that the demand for skilled workforce is bound to expand many folds in the near future. Hence the quarters for pursuing skill have to be expanded and empowered. Moreover, they have to be made more accessible and attractive to both the domestic and international students.

Internationalisation indeed may engage in diverse areas that include: attracting international students to our domestic campuses, offer students exchange programmes, provide students study abroad programmes, facilitate faculty collaboration and dual degree programmes. However, what has to be envisaged is the movement from student mobility to program and provider mobility.

At this point, it is inevitable to have a candid appraisal of the higher education scenario prevailing in our country. Needless to say, higher education in India has a higher role to play taking into account the demographic specificities. “China has the world’s largest higher education system, enrolling more than 27 million students. India is in the number 3 position with 14 million students” writes Philip Altbach (25). The practice of Higher education in India is not a triumphant case. It is plagued by numerous impediments such as to cite a few include: limited public resources, over centralisation, dearth of quality institutions, non-challenging Ph.D. programmes, shortage of faculty with higher qualification and insubstantial research experience. These factors account for the weakening of higher education concurrently leading to the growth of surrogate systems ending up in the hegemony of private providers widening the economic divide. Hence what needs to be conceived of is equipping the human work force with quality, skilled in confronting the global economic environment simultaneously promoting sustainable environment. Moreover, promotion of cultural development at the regional and community levels and rendering service to the need of public affairs are yet other factors desired from this process.

Broadly speaking, internationalisation of higher education needs to work at different levels: centralisation and decentralisation should work

synchronously. Along with a central body at the national level that engages in policy making, guidance and monitoring, the universities concerned should also be given the latitude to design and set the scope and limit of the international participation. As higher education entails sophisticated and strategic research oriented studies, necessary checks and balances need to be maintained. Thus along with these two levels, at the primary level, the colleges concerned may also be given the role of fixing the level and scope of this process. Hence this decentralisation not only avoids absolute centralisation, but also guarantees a centrally decentralised approach that will take into confidence all the stakeholders which mutually benefit all.

The purview of internationalisation needs to go beyond a short term-programme oriented collaboration that mostly reduces itself in conducting collaborative seminars, conferences or workshops. It needs to be envisioned with sustainable, enduring cooperation and collaboration that will finally give way to the emergence of new pedagogy, technology, new inventions and discoveries. However, it must be made sure that the curricular internalisation should never hike the standards beyond proportion that deter students belonging to middle and lower classes from taking up advanced courses.

Internationalising the domestic campuses is the other prospective facet of this process. Domestic campuses have to attract foreign recruitment and at the same time foster integration of foreign students. A quality presence of foreign students would promote the collateral development of domestic students' cultural understanding, and an increase in enrolment and tuition revenue that ultimately serve the international economic needs.

Impending challenges

Countries that have introduced internationalisation of higher education while appreciating its advantages points also to the bumpy ride, the vulnerability involved and the incipient gap between the policy and practice, rhetoric and reality. One of the effects of the process of internationalisation is the obligatory

substantial autonomy the individual institutions need to be endowed with and the diverse sources of financial support that need to be mustered. These neo-liberal reforms finally result in relaxation of the university established standards, empowering the institutions with autonomy. However, the concurrent consequences would be; grants becoming more competitive, funding depending on performance orientation, rigorous evaluation and accreditation systems. Tsuruta while listing the negative factors as experienced in Japan points to the prolonged financial woes, increasing complexity in recruitment procedures and lack of overall support structure (145). Other problems that are encountered by the implemented countries and those that are likely to show up in our country include:

- Issues related to recognition
- Problems involved within accreditation
- Intellectual Property Rights
- Curriculum conceptualisation
- Course design and materials preparation
- Diversity and complexity of academic institutions and systems
- Brain drain/Gain
- Faculty qualification and support

Nevertheless, when the world nations forge ahead with practices of internationalisation, we should not be left behind. Adding to this, the paper wishes to place a study conducted by Bohm. Accordingly, *The Global Student Mobility 2025 Report* in 2002 predicts that the demand for international education will increase from 1.8 million international students in 2000 to 7.2 million in 2025. (Knight 44)

Finally to round up, let the fact be not denied that India being blessed with more young work force than other western countries who are about to face employee crunch can transform into a reliable hub of skilled labour force.

Foreseeing these potentialities of employment opportunities within and abroad, we need to undertake concerted efforts to conceptualise, mobilise and perpetuate the benefits of the dire need of internationalising the Indian higher education system.

References

- [1] Altbach, Philip G. “The realities of mass higher education in a globalised world.” Eds. Johnstone, D. Bruce, Madelieine B. d’Ambosio and Paul J. Yakoboski. *Higher Education in a Global Society*. Cheltenham: Edward Elgar Publishing Ltd., 2010. Print.
- [2] Knight, Jane. “Higher education crossing borders: progress and providers on the move.” Eds. Johnstone, D. Bruce, Madelieine B. d’Ambosio and Paul J. Yakoboski. *Higher Education in a Global Society*. Cheltenham: Edward Elgar Publishing Ltd., 2010. Print.
- [3] Tsuruta, Yoko. “The knowledge society and the internationalisation of Japanese higher education.” *Asia Pacific Journal of Education* 33.2 (2013): 140-155. Print.

Resisting Autocratic Regimes for Human Rights: A Study of Poile Sengupta's Play *Samara's Song*

Deepa George

Department of English, St. Paul's College, Kalamassery,
Kochi 683503, India; deepasonygeorge@gmail.com

Abstract

The citizens of a state are entitled to enjoy good governance, fundamental human rights, civil liberties and security to life and property. But in many of the autocratic states the world over, fail to provide the desired political goods to the citizens in adequate measures. Such states eventually collapse because of mounting tension and conflicts within. Despots rule and corruption becomes rampant. People become prey to flawed institutions, violence and terrorism. This paper is an attempt to point out the factors that lead to failed states and how the public rise up in revolt when the situation worsens beyond all limits. The paper explores how revolts and rebellions occur with the hope of establishing a better order through Poile Sengupta's play Samara's Song. Essentially a political play, Samara's Song explores the dangers involved in a dictatorial regime impeding democratic values and the degeneration caused due to politics in human relationships.

Key words: Human rights violation, democracy, ideology, totalitarianism, surveillance, conspiracy, resistance

“I do have an unyielding belief that all people yearn for certain things, the ability to speak your mind and have a say in how you are governed, confidence in the rule of law and the equal administration of justice, government

that is transparent and doesn't steal from the people, the freedom to live as you choose" (Tripathi 107). Barack Obama uttered these words at Cairo University on June 4 with a vehement hope for what people expect of a fair rule which is very often repudiated in autocratic regimes.

Nigerians voted for a former military ruler with the hope to bring a strong democratic government to power that would put an end to prevailing inhuman acts of brutality in the country. Though it claims to be a democracy, the recent past itself is testimony to the fact that military dictatorships and grey zone regimes with democratic institutions functioned as wolf in sheep's clothing. Or else we wouldn't be witness to the gross human rights violations perpetrated by Boko Haram on a day to day basis. It has been pointed out the rampant corruption that has demolished the country's peace. Several thousands were killed in political violence and about 1.5m people were forced to flee their homes (Nigeria's election). The Chibok kidnapping of school girls was condemned all over the world. The government was inept in restoring peace and failed to bring justice to the victims.

It is beyond doubt that a strong democratic government stands by its people. But unfortunately authoritarian regimes which go against the democracy principle are not that uncommon even in today's political landscape. *Time Magazine* in 2011 listed out the top ten autocrats in trouble. It is not surprising to find Hosni Mubarak, Ali Abdullah Saleh, Kim Jong Il, Alexander Lukashenko, Omar Hassan al-Bashir, Mahmoud Ahmadinejad, Robert Mugabe, Emomali Rahmon, House of Saud, Abdelaziz Bouteflika in the list (Top 10). According to Juan Linz, "authoritarian regimes are political systems with limited, not responsible political pluralism, without neither intensive nor extensive political mobilization, and in which a leader or a small group exercises power within formally ill-defined limits but actually quite predictable ones" (Linz 255). When

a single leader with either no party or a weak party gains control by force there is borne an autocratic regime. Decisions taken by a single individual, the elite, a junta or an oligarchy privilege a small group. Dictatorship involves a non-democratic representation. In *The Origins of Totalitarianism* Hannah Arendt highlights the uniqueness of totalitarianism, calling it a new and extreme form of dictatorship comprised of “atomized, isolated individuals” (323). She posits that ideology plays an important role in totalitarian regimes. The masses are made voiceless through an unleashing of terror exacting compliance and the actors in this mass control are the leader, the secret police and the party if there is one.

Authoritarian regimes continue to subsist due to several factors. Most dictatorships come to power through a coup- carried out very often by military officers or, less frequently, members of revolutionary parties. The leader once in power tries to maintain it at whatever cost. However, there are limiting factors. If the military is very powerful before the seizure of power it results in military dictatorship, if the party is seizing power it results in single party dictatorship and in the case of weakly organized groups single person dictatorships are likely to result.

Militaries are motivated to intervene when their corporate interests are threatened or when they lose faith in the existing civilian government. Conducive conditions like bifurcated and polarized societies and economic inequality pave way to military regimes. Power can bring out the best or the worst in a person. But the history of autocracy proves that very often power has bred unfettered violence and suppression. In a conversation to Richard N Haas, President, Council on Foreign Relations, Benazir Bhutto the assassinated former prime minister of Pakistan speaks of General Pervez Musharaff’s military dictatorship. “...under General Musharaff, has fuelled the forces of extremism, and military dictatorship puts into place a government that is unaccountable, that is

unrepresentative, undemocratic and disconnected from the ordinary people in the country, disconnected from the aspiration of the people.... Moreover, military dictatorship is born from the power of the gun and so it undermines the concept of the rule of law and gives birth to a culture of might, a culture of weapons, violences and intolerance” (Yasir 124). Autocracy may not allow a fair trial to its political prisoners. Ms. Bhutto gives an emotionally charged account of her father Zulfikar Ali Bhutto’s assassination inside Rawalpindi Central Jail on April 4, 1979 in her autobiography. The dictator Zia ul-Haq who infact was a close associate of Zulfikar Ali Bhutto engineered the blood curdling murder on fear of a failure in the forthcoming elections [3].

Carl Friedrich and Zbigniew Brzezinski list out six basic features that constitute the character of totalitarian dictatorship. (1) An official ideology, which would be forcefully made binding on all and consisting of an official body of doctrine covering all vital aspects of man’s existence, (2) a single mass party led typically by one man , the “ dictator”, (3) a system of terroristic police control, supporting but also supervising acting against the demonstrable enemies of the state and arbitrarily selected classes of the population (4) near complete monopoly of all means of communication (5) a near complete monopoly of all means of effective armed combat and (6) a central control of the entire economy [9-10].

Ideology has played a significant part in shaping the thinking of quite a few dictators. To cite an example Hitler was notorious for his anti-Semitic aspect of Nazi ideology. His studies on the Jewish question turned him from a feeble being to a fiercely cruel anti- Semite. Hitler backed by the Nazi party exercised absolute power. When a decision was taken no one ever counted. Only the ‘Fuhrer’ had the right to decide. The Constitution of the country was the will of the Fuhrer. The Holocaust led to the murder of more than seven million Jews,

Gypsies etc. by the Nazis during World War Two. During the Holocaust, factories of death, such as at Auschwitz-Birkenau, Sobibor, Chelmno and Treblinka, were built to ensure that the mass murders were carried out. In the staggering genocide people were machine gunned in batches, shot in the head at the edge of trenches, burned alive while crowded into churches, gassed in vans or fake shower rooms, starved or frozen to death, worked to death in camps, or beaten or tortured to death simply because of their race, religion, handicap, or sexual preference.

In Cambodia, the Khmer Rouge (KR) regime led by the dictator Pol Pot between 1975 and 1979 killed one and a half to three million people which is today called the Cambodian genocide. Pol Pot emptied the cities by killing the intelligentsia, the professionals and technicians as he was against the bourgeoisie and its foreign influences. The KR branded a big chunk of the population as 'old people' to evict them from urban centres, and a brutal unleashing of power led to forceful arrests, torture, mass murders and malnutrition which decimated about 25 percent of the population. Around 20,000 mass graves, known as the Killing Fields, uncovered is an agonizing testimony to Pol Pot's victimization of urban dwellers (Bartrop 244).

Autocracy has led to economic disasters or economic miracles in many countries depending on those in power. Lee Kuan Yew the first prime minister of Singapore who drew the attention of his critics for his "dictatorial tactics and the stifling of the dissent and the media, but his admirers always viewed him as a benign dictator who ran a welfare state"(Baru 9). But the situation is far from promising in many dictatorial regimes across the world. Zimbabwe has seen the worst of times, under the despot Robert Mugabe who has crushed opposition with an iron hand, and made a fortune for himself. Zimbabwe is reeling under inflation and negative growth today. Mugabe came to power in 1987 with his

party Zanu-PF winning a landslide victory. But his regime has presided over social and economic decline. Mugabe even as a nonagerian, continues as the President by use of force and violent suppression of opposition. He has contested several elections but through fear and intimidation has managed to skew votes in his favour and remain in power. (Top 10)

Most autocracies today hold multi-party elections only to create a democratic façade to hide the autocratic rule. The big question is why hold elections only to steal them. On June 12, 2009, Iran held a presidential election whose outcome was pre-ordained. The next day the authorities declared the incumbent president Mahmoud Ahmadinejad the winner. Protests erupted and millions flooded the streets. Then world watched while the government responded with sweeping human rights violations. (Hafner 1)

In the electoral run off conspiracies are hatched and plots executed. Libel suits are pursued to ensure the destruction of opponents. Faux elections are often held by dictators where there would be a single party in the fray and the world knows that such elections are illegitimate.

Freedom of expression is highly restricted and it goes beyond saying that state controlled television systems within contemporary autocracies such as China and Vietnam and severe limits on independent journalism as in Zimbabwe, Syria have detrimental effects in the realization of human rights. There are ample evidences against bloodthirsty killers, rulers who violated the basic human rights of their countrymen and women to slake their own thirst for power and fame.

Notorious autocracies depend on secret police who are intelligence services or police and law enforcement agencies which operate in secret to protect the political power of an autocrat or a totalitarian state. They are beyond and above the law. It is common knowledge that Saddam Hussein's

'Mukhabarat' and Hitler's 'Gestapo' suppressed political dissent through clandestine acts of fear and intimidation such as kidnapping, coercive interrogation, torture, internal exile, forced disappearance and homicide.

Dictatorships and uncontrolled human rights violations will continue unabated if prompt interventions are not done. Military intervention can put an end to widespread human rights violations as it happened in Cambodia. The Khmer Rouge was overthrown by a military intervention on the part of Vietnam. But peace may not always prevail as it happened in the case of US intervention in Somalia in 1993 and it resulted in the loss of several lives. Several state led humanitarian interventions have also been alleged as pursuing their own national security issues.

Seeking assistance from and as part of The Responsibility to Protect (RtoP) a new international security and human rights norm is a viable option. It is a concept that addresses the issues of failed states through humanitarian interventions and ensures the victims' rights to survive. The civilians themselves can stage protests and revolutions before the situation goes beyond control as it happened in the case of French Revolution. States should make global commitments and sign on human rights treaties at the global level. Even individuals in conjunction with non-governmental organizations can successfully agitate for human rights.

There are Human Rights Organisations like *Human Rights Watch* and *Amnesty International* who lobby for specific actions for other governments to take against human rights offenders including specific individuals for arrest, or for sanctions to be levied against certain countries, recently calling for punitive action against the top leaders in Sudan who have overseen a killing campaign in Darfur. Writers, journalists, social activists etc. can up with powerful critiques against injustice in democracy and good examples can be had in the writings of

the French philosophers – Voltaire and Montesquieu who have inspired people with revolutionary ideas of liberty and equality.

Poile Sengupta one of the leading playwrights writing in Indian English expresses deep felt concern with issues of politics and ‘good governance’ in her play *Samara’s Song*. Essentially a political play, it explores the dangers involved in a regime impeded by democratic values and the degeneration caused due to politics in human relationships. The imaginary land of Eos which forms the setting of the play, stands for any of the fledgling nations today with high aspirations for democracy and a properly elected government. Thandwai, the iron fisted lady is felt only as an invisible voice. As the widow of the deceased President, she has taken up the reins of the country in her hands. Her insatiable greed for power makes her suspend free and fair elections in the land under the cover of a prolonged mourning period for the death of its President. The citizens of Eos await the return of their beloved Prince Ashti nurturing hopes that he would be able to contest and win the elections and thus restore peace in the land. Samara, the mute and shadowy central character in the play is a foil to Thandwai in many ways. ‘Samara’ in Sanskrit means war and disquiet and it is also the name of a war torn heavily bombed Iraqi city. The tongueless Samara is a symbol of the powerless state and its people silenced by Thandwai’s dictates. Her song becomes the leitmotif to resist autocracy for a just democratic rule. Samara’s wailing notes speak of dry desert winds, of famine and thirst, of despair in the human heart.

At the outset Eos is reeling under severe economic crisis and the populace is denied of basic necessities like clean water in sufficient quantities. Arrah, an urban underprivileged woman, with a fierce survival instinct makes a pertinent comment on the apathy of the government. “This water government is

giving. That is why it is coming in small small miser drops...After three days water has come.” (Sengupta 286)

The playwright introduces three historians who are not merely observers of the dramatic narrative but are also impaired and therefore prejudiced, in their recording of the country’s history- one blind, one deaf and the third mute. As the Marxian dictum goes, “the ideas of the ruling class are in every epoch the ruling ideas” i.e. the class which is the ruling material force of society, is at the same time its ruling intellectual force (qtd. in Appleby186). The historians naturally have the tendency to record in favour of the ruling class. E H Carr the British historian who saw real dangers in interpretations that distorted reality vehemently protested against the view that ‘the facts of history are nothing, interpretation is everything’ (qtd. in Evans 224). In the play the distorted representation of history stewards the world of Eos. The deaf man candidly admits that there is no representation of the poor masses in his ledger as the ink ran out. The three physically challenged historians play the roles of a modified form of the Greek chorus and the sutradhar. Their records offer a comment on the abuse of power of the state by authority figures and the violent exploiter-exploited relationship.

Eos is a pseudo democracy and is presented as a country with a democratic system only on paper but hidden within, an authoritarian government which doesn’t allow free and fair elections and the chance to change the rulers by the people. Thandwai has proclaimed herself as the undisputed leader after the death of her husband but all her actions are shrouded in mystery. She never appears before the public under the pretext that she is in mourning for her dead husband. The citizens experience her presence as a harsh female voice appearing on telescreens. One gets reminded of Big Brother the enigmatic dictator in George Orwell’s novel *Nineteen Eighty- Four* and the imaginary nation Oceania, a totalitarian state, which keeps its citizens under constant surveillance by the

authorities mainly by telescreens. Her frequent appearance on a portable screen could be a strategy to arouse fear, forge an image of elusiveness and project an image of infallibility and omniscience. She wouldn't even allow her daughter Princess Sabah come to her in the first six months of mourning. She becomes a typical unpopular autocrat through her evasiveness.

It is common knowledge among the people of Eos that Thandwai can cut tongue which is a symbolic gesture of the curtailed freedom of expression. According to the Universal Declaration of Human rights, freedom of expression is the right of every individual to hold opinions without interference and to seek, receive and impart information and ideas through any media and regardless of frontiers. Samara the servant girl is a victim of the autocratic regime. Thandwai cuts Samara's tongue to keep a secret from leaking out. She manages her misdeeds through her bureaucracy who are fatly paid to remain loyal to her. She buys off the unsuspecting Hamun by elevating him to a post in the civil service. Hamun who is honest to his people doesn't realize that "in the dark and mire of politics, one often grabs the wrong hand, mistaking it for an offer of help, of friendship." (Sengupta 325)

Conspiracies take place at different levels in the play. As the blind man points out "the deepest conspiracies start in the family. Father against son, brother against brother... wife against husband" (310). The uneven relationship between the First lady and her daughter is based on a feeling of betrayed love, as of blackmail. Sabah has an eye on the throne and her mother is not ready to bequeath it neither to Ashti the rightful heir nor to her daughter.

People of Eos know that their hope depend on the return of Ashti the son of the dead leader in his first marriage. Thandwai offers a friendly welcome to her stepson and announces elections immediately. But she plots against him and arranges for his murder as he made his way to address the rally. The plan is

executed and he is felled by cruel hands just as he was starting what would have been a magnificent career in the service of his country. Hamun Krabi in his attempt to save the Prince is also murdered. Samara's song is silenced forever as she becomes a silent victim to the cruelty of Sabah.

Repression can also foster conspiracy which brews up towards the end of the play through a sudden explosion of repressed anger. The dynastic politics in the play starts a spate of violence. The public rise up in revolt against the treacherous and villainous rulers. The blind man poses a few questions. "When do the masses suddenly rise up and storm the Bastille or the palace or the nearest police station? No historian can actually separate the facts from the chaff, from the dust, from the grain... What starts as a whisper, a lilt of a rumour gradually, inexorably turns into a storm, a whirlwind, a cyclone with no centre, a howling mob with one red eye"(344). The masses rise against oppressive powers and seem to have lost their earlier disabilities. Thandwai is poisoned by her own daughter. The play ends on a note of chaos but with anticipations for a change.

Liberty is ensured only through resistance. Resistance may be peaceful as in Gandhian Non Co-operation or violent as in French Revolution. As Woodrow Wilson, the former US President maintains "The history of liberty is a history of resistance. The history of liberty is a history of the limitation of governmental power, not the increase of it (Wilson and Link124)". Rebellions, revolutions or tiny acts of individual resistance peaceful or otherwise have succeeded in building up of a state free of tyranny and suppression.

References:

- [1] Appleby, Joyce Oldham, *Knowledge and Postmodernism in Historical Perspective*, New York: Routledge, 1996. *Google Book Search*, Web. 3 July 2015.

- [2] Arendt Hannah, *The Origins of Totalitarianism*, Harcourt Inc:Harvest, 1976. Print.
- [3] Bartrop, Paul R and Samuel Totten, *Dictionary of Genocide*, Greenwood, 2007. *Google Book Search*. Web. 3 July 2015.
- [4] Baru, Sanjaya, “Strongman who took Singapore to the First World”, *The Hindu*. 24 March 2015.
- [5] Bhutto, Benazir, *Daughter of Destiny: An Autobiography*, New York: Harper Collins, 2008.
- [6] Evans, Richard J, “Objectivity and its Limits”, *In Defence of History*, London: Granta, 1997.
- [7] Friedrich, Carl J. and Zbigniew K. Brzezinski. *Totalitarian Dictatorship and Autocracy*, New York: Frederick A. Peger, 1961. Print.
- [8] Hafner, Emilie P, *Making Human Rights a Reality*, Burton Princeton: Princeton University, 2013.
- [9] Hussain, Yasir, *The Assassination of Benazir Bhutto*, New Delhi: Epitome Books, 2008. Print.
- [10] Linz, Juan Jose, *Totalitarian and Authoritarian Regimes*, Colorado: 2000, *Google Book Search*. 3 July 2015.
- [11] “Nigeria’s Election: The Least Awful,” *The Economist*, 7 Feb 2015, Web. 3 July 2015.
- [12] Sengupta, Poile, *Women Centre Stage: The Dramatist and the Play*, New Delhi: Routledge, 2010. Print.
- [13] “Top 10 Autocrats in Trouble,” *Time*, 1 Feb 2011, Web, 3 July 2015.
- [14] Tripathi, Deepak, *Imperial Designs: War, Humiliation and the Making of History*, Virginia: Potomac, 2013, *Google Book Search*. 3 July 2015.
- [15] Wilson, Woodrow and Arthur Stanley Link, *The Papers of Woodrow Wilson*, Vol. 25, Princeton: Princeton UP, 1978, *Google Book Search*. 3 July 2015.

**Mental Maladies and the Pursuit of Happiness:
A Critical Analysis of the Treatment of Folk in the Select
Novels of Anita Nair.**

Bini John

Department of English, St. Paul's College, Kalamassery,
Kochi-683503, India; *mjbini@gmail*

ABSTRACT

The paper attempts to examine the folk behaviours and patterns in the select novels of Anita Nair. Folk patterns recur in modern literature in various ways. Entangled in intricacies of their lives, Anita Nair's character rely upon folk beliefs to solve the problems.

Key words: Folk elements in literature, Anita Nair's Novels.

Oxford Dictionary of Critical Theory defines Cultural Studies as “An interdisciplinary approach to the study and analysis of culture understood very broadly to include not only specific texts, but also practices, and indeed ways of life”(103). And, Illustrated Oxford Dictionary defines folklore as “the traditional beliefs and stories of a people; the study of these” (312). Oxford Dictionary of Critical Theory defines culture as “A set of beliefs, practices, rituals, and traditions shared by a group of people with at least one point of common identity” (105). These three definitions establish a close link between cultural studies and folklore.

Literature approaches folklore in an objective and empirical way. Identifying the themes and characters, the writer recontextualises the folk element he/she has identified as suitable for his/her fiction. Various modern writers have equipped their knowledge of folk practices into their fiction, either to define the purpose of their characters lives or to create the milieu. Mark. J. Smith in his essay 'A Genealogy of Culture: from Canonicity to Classicism' asserts that "Advocates of the model are rearticulating elements of the past with new ones in quite different ways and these will be read in very different ways by specific audiences at different times and places"(14). Writers like William Faulkner and Edgar Allan Poe used folklore to serve their art. But Mark Twain's *The Adventures of Huckle Bery Fin* has identifiable elements of folklore in it. The moral and physical texture of the novel is embellished with folklore. The ultimate transformation of his character Jim is accomplished with the use of superstitions ("Folklore in Literature"). This recontextualisation is not an end in itself, but a means to achieve the objectives of the writer.

Anita Nair, the author of *Magical Indian Myths* has acknowledged the fact that she has an appetite for myths and legends. In her fictions, her fascination for myths, folklore and legends makes her account vivid. This paper is an attempt to analyse the elements of folk behaviour embedded in two of her novels; *The Better Man* and *Lessons in Forgetting*. *The Better Man* revolves around Mukundan Nair , the elite in Kaikurissi and Painter Bhasi, Kaikurissi's eccentric genius. Mukundan Nair, the only son of Achuthan Nair has retired as the Assistant Works Manager, Grade II and had planned his retired life to be spent in Coimbatore. His reluctance to return to his ancestral village is intensified with the thought of his brutal father and his dead mother. But the unexpected turn of events made him change his plan and to return to Kaikurissi.

Lessons in Forgetting is about the struggles of a deserted wife, Meera to re-claim her identity. Giri, the Corporate was attracted to Meera because of her Lilac colour painted, picture perfect house (35). From then onwards Meera has been his “Goose girl of the Lilac house” (35). The precision and uniqueness of their life was immediately lost as they were dragged into the larger realities of monotony of the Lilac colour and the presence of a nagging mother and a celebrity grandmother. Meera is a famous cook book writer and her recent work, *The Corporate Wife’s Guide to Entertaining* has been received well. The novel opens with a party scene, introducing the reader to the life lead by the rich and elite and in which Meera and Giri are participating. But towards the end of the Party Meera notices the absence of her husband and was dropped in her apartment by a stranger. Giri had left for the better. Meera who has been totally obsessed with the effort of maintaining a life to Giri’s expectations, is now left barehand without even the details of what has happened to her husband. All through her married life she has been Heera, the mythical character who was the wife of Zeus. She fails to accommodate the reality of being a deserted wife. She was left with little income and a large household to manage. But instead of giving up she fights and success follows her once she accommodates her identity truthfully. Her false identity of Heera has been broken by the disappearance of Giri. And now she is Meera once again. What had remained permanent has vanished and newer realities are substituted.

The characters in both of the novels undergo similar mental trauma. When Mukundan is about to fail in his attempt to adapt to his village life he finds a saviour in Bhasi. Meera finds answers for her issues with JAK, the Professor of Cyclones. Mukundan is in deep distress as he returns to his village Kaikurissi, because it reminds him of his brutal father and his concubine and the subsequent loneliness of his mother. Above all, his own failure to save his mother from her domestic tragedy, constantly troubles his mind. Mukundan’s personal tragedy is

identified by only a single person and that is Bhasi. Their relationship leads ultimately to a fulfilling one, after traversing through much rough paths. It is a relationship that does not fit in a normal definition because Bhasi in his social status holds a much lower position than Mukundan. But the moment Bhasi identifies the sick soul of Mukundan he is subjugated into the position of a patient.

Yet, Bhasi is confused because for him, mukundan is more of a friend and a confidant. But with the poignant knowledge that, every patient should be relieved at one point from the doctor, he treats Mukundan. "... for Cultural Studies, all aspects of society and culture are related to and embedded in power relations"(Nayar 48). It is the power of identity [identity of a folk medicine practitioner] that provide Bhasi the authority over Mukundan. Mukundan, at the same time in various other aspects, like; religion, education, family and ethnicity is powerful than Bhasi. The complexity of their relationship can thus be a product of their mutual subordination. The relations and oppositions in ideology and ethnicity further intensifies their bonding.

Bhasi is not a trained medical practitioner, but with the skill of a modern doctor he takes care of Mukundan. He practices it like an art. As Farokh Erach Udwadia says in his book *The Forgotten Art of Healing and other Essays*, "There is an art to medicine, an art based on human values, which immeasurably enriches its science, art which when combined with science not just cures, but also heals"(Preface). It is the power of Bhasi's knowledge of the folk medicines and the capability to delve deep into the mental artefacts of his patients, which acquired him the title of a successful folk medicine man. For him the distressed patient is equally important along with the curing of the disease. Bhasi's technique of treatment is almost similar to that of a modern doctor where he pays attention to his patients' ailments. Farokh Erach Udwadia has said in the essay

'The Forgotten Art of healing', "Listening can provide a therapeutic catharsis for a patient, an education for the doctor and thus is often the secret of healing" (4). Mukundan and Bhasi spent their evenings in constant conversation and by paying attention and not opinions, Bhasi gains his confidence. He judges his patient as a whole – the mind and the body. He listens effectively with his whole self. In these ways Bhasi is not just brilliantly characterised by the writer, the writer also succeeds in recontextualising and reestablishing the authority of a rich folk tradition.

Along with these rich characterisations the writer also discusses certain social evils which remain in human minds even when they are abolished by law. The domination of Philipose over Kamban invites the reader's attention to the social evil of caste system which segregates human beings. The dominance based on caste system which normally remains intact challenged by the folk black magic. Kamban fits perfectly well in Gayatri Spivak's notion of subaltern. He is silent. But this silence is taken for granted by Philipose who tortures Kamban for his caste status. But the night in which Philipose is attacked by the cat he is petrified and later decides to leave Kaikurissi. The chapter is ideally titled by the writer as 'Sleeping Dogs Bite Twice as Hard' (164). Later, it was Krishnan Nair who revealed the secret behind Philipose' hasty leaving. "...Harijans of the village were kept at a distance for more than just their association with excrement. They were feared to be Odiyans. Men who had made a pact with the devil. Men who could snuff your life out if provoked" (167). Kamban's silence now is pregnant with meaning. He derives power and authority from his native knowledge. He who has till then been remaining effaced and spoken for acquires a position much higher than he was assigned in the social structure. Here again folklore becomes the 'science of survival' (Laugh 15).

Lessons in Forgetting is an intriguing narration of the dilemma of two major characters; Meera and Jak. Each in their own spheres is trying to untie the knot of which they have to find a slack one. Giri, who knew the secret of untying relations has once advised Meera; "...Patience, Meera, patience. That is all you need to work any knot open. Keep teasing it and you will find a knot with a bit of slack and once you do, you are home" (91). Prof. J. A. Krishnamurty is in search of this weak string in Minjikapuram, the place in which his daughter has been brutally tortured. Minjikapuram "After the hustle and bustle of Madras, it had appeared quiet and provincial"(49). This rural locale is the final place which dissolves the problems faced by both the major characters. The place which has been disastrous for Smriti, the roar of the sea waves which did not reveal the names of the culprits who annihilated Smriti, everything remained "A bottomless abyss." for Jak.

Meera in her attempt to adapt and construct the new identity goes for a complete make-over. She has been sporting the same hair style for the last twenty years. She continues, "Ever since Giri came into my life. And I didn't want to change a thing. My hair, my home, my dreams, myself. I so wanted it to be what he wanted". And when the salon girl suggests the necessity of a new look Meera thinks, "It's time I became a new woman. Someone I would like to be" (198). Jak and Meera are on their path of transformation and the backdrop of Minjikapuram accelerates it. The rough weather and the angry incessant roar of the sea waves and the unyielding nature of the people, signifies the agony that Meera and Jak are undergoing. Here thus the folk locale grew to the level of a determiner of people's fate. It was their superstitious resentment towards girl children that has dragged Smriti into the mire she was caught. But at the end of the novel the only sign of hope about Smriti, is given against the ebb and flow of the sea waves. The moment at which Jak arrives at the truth of what has happened to Smriti at Minjikapuram, Smriti regains her memory. Minjikapuram liberates Kala Chiti and Meera from their false identities. Meera is saved from her false persona of

Heera and Kala Chiti from the bondages of a loveless marriage. In their struggle for freedom, all these characters reach their own haven, in the milieu of Minjikapuram.

From a structuralist point of view anything that generates meaning through certain forms of representation is a 'text' (Nayar 50). The folk milieu constructed by the writer in her fiction constitutes her characters identity. The meaning generated depends on our understanding of these folk elements. Folk elements structure the grammar of the lives of the leading characters; the rules that will define their lives as a success or failure. Thus the characters become signs and folk behaviour their signifier, providing them with a universal identity.

References:

- [1] Buchanan, Ian, *Oxford Dictionary of Critical Theory*, New York: OUP, 2010. Print.
- [2] Nair, Anita, *Lessons in Forgetting*, Noida: HarperCollins Publishers, 2012. Print.
- [3] *ibid*, *The Better Man*, New Delhi: Penguin Books, 1999. Print.
- [4] *ibid*, *The Puffin Book of Magical Indian Myths*, New Delhi: Puffin Books, 2007. Print.
- [5] Nayar, K Pramod, *An Introduction to Cultural Studies*, New Delhi: Viva Books, 2011. Print.
- [6] Smith, J Mark, *Culture Reinventing the Social Sciences*, New Delhi: Viva Books, 2005. Print.
- [7] Udwardia, Farokh Erach, *The Forgotten Art of Healing and other Essays*, New Delhi: OUP, 2009. Print.

Haunting Fantasy: A Study Based on JK Rowling's Harry Potter Novels

M. K. Haider

Research and Development Centre, English Department,
Bharathiar University, Coimbatore; haiderkawish@yahoo.com

ABSTRACT

Fantasy has the longest and richest literary heritage of all of the forms of genre fiction. Indeed, fantasy could be said to be the progenitor from which the other forms came from. Fantasy has been distinguished from other forms of literature by its style and its freedom of expression when an author has the ability to use any story telling element to strengthen the narrative. Different writers, scholars and critics have defined fantasy in different ways but what it exactly means is elusive and hard to define. J.K.Rowling has created a sensation in the literary world by writing Harry Potter novels series which has attracted people of all age groups. Rowling's creation has infused the imaginations of readers of varying age groups - children, parents, and grandparents. The cultural tsunami suggests Harry Potter is not a passing fad. This study aims at defining fantasy literature and finding out how and why it is different from other forms of literature. This article also attempts to make an enquiry into the cause of popularity of fantasy literature in general and Harry Potter in particular.

Key words: Imagination, Made-up, Magic, Wizard

The popularity of fantasy has risen swiftly in recent years, an increase accelerated by prolific and talented writers determined to change the way fantasy is written and by the proliferation of fantasy in multiple mediums- the novel, the

graphic novel, the video game, and film- changing the way fantasy is disseminated.

According to the Oxford English dictionary fantasy means, “A pleasant or desirable imaginary situation, the faculty or activity of imaging improbable things.” Fantasy is a fiction or a “made up” story that has elements or parts that are not realistic. Characters may have magical and supernatural powers or use some futuristic technology that allows fantastic things to happen. It is a genre that is generally concerned with the conflict between good and evil, and with the use of magic.

Fantasy allows children to live in an imaginary world where anything is possible. Everybody loves fantasy because it gives freedom and relaxation to them. Fantasy cannot be successful, however, unless it is grounded in logic. The author must provide strong characters and explain the fantastical world in great detail.

Fantasy, derived from the word fantastic, exercises our sense of wonder. The fantasy genre gives writers the freedom to explore ideas unchained by the restrictions of writing stories set in the real world. This is the appeal for the writers. The fantasy genre is rich and varied. It means different things to different people. Writers love the freedom, the genre gives them to explore themes and ideas. As Kate Forsyth says:

I think fantasy is best described as a kind of fiction that evokes wonder, mystery, or magic, a sense of possibility beyond the ordinary world in which we live, and yet which reflects and comments upon that known world [05].

At the most basic levels, fantasy can be defined as literature which contains elements that do not or cannot exist in reality. There are, however, connotations attached to the genre that must be taken into account when defining it. Most of the writers agree that fantasy is heavily based on the on the roots of folklore and mythology, and contains archetypes that are universal. Quoting

author Mollie Hunter, Beth Greenway relates that “ There is only a succession of folk memories filtered through the story’s tellers imagination, since all mankind shares in these memories, they are the common store on which the modern story teller must draw in his attempts to create fantasy”[3]. Fantasy is also usually considered to be a genre of quest stories, those stories in which there is a journey being undertaken by the characters in some fashion. Most fantasy stories involve heroes, and many of these heroes are those who start from an ordinary or underdog status and have become heroes.

Fantasy, surely, is dragons, elves, broomsticks, fairies, ghosts, vampires, and anything which goes bump in the night. The most obvious construction of fantasy in literature and art is the presence of the impossible and inexplicable. This helps to cut out most science fiction (sf) which regards everything as explicable. The genre starts at the point where science ends. Different writers have different views about fantasy. Some of these are:

1. Katherine Hume understands fantasy in terms of psychological and aesthetics response to mimesis.
2. Tzvetan Todorov’s ideas about fantasy narrow the field to a very tiny sliver, in which only those texts that maintain ‘hesitation’ are fantastic.
3. Rosemary Jackson understands fantasy to be a ‘literature and or desire’, a term picked up by those interested in the psychology of the fantastic. Jackson also argues that fantasy is innately subversive, in that it offers alternatives to and escape from the ‘real world.’
4. Colin Manlore regards fantasy as a form of allegory, and his selection of text is highly coloured by this.

Fantasy and not realism has been a normal mode for much of the history of western fiction (and art). The ancient Greek and Roman myths, the medieval romance and early modern verse and prose texts all commonly use what we

consider to be the tropes of fantasy: magical transformations, strange monsters, sorcerers, and dragons, and the existence of supernatural world.

The earliest forms of written fiction that we have from the ancient world are works that we might understand as fantasy and which have influenced many modern fantasy writers: stories about Gods and heroes, such as the epic of Gilgamesh and the works of Homer. His *Odyssey*, which includes giants, sorcerers, and monsters, is a harbinger for much later fantasy fiction. The first modern fantasy writer is usually considered to be William Morris. He combined imaginary worlds and the supernatural in the late nineteenth century with a series of Medieval-romantic novels including *The Wood beyond the World and the Well at World's End*. But it was in the early 20th century when fantasy really started to gain a foothold with writers such as the fairytale lover Lord Dunsany, who wrote *The King of Elfland's Daughter*. Fantasy fiction has always been more about visionary ideas than it has been about the writing.

The popularity of fantasy genre has continued to increase in the 21st century as evidenced by the best-selling statuses of J.K. Rowling's Harry Potter series. The American Library Association's Office for intellectual freedom announced in January 2000 that J. K. Rowling's Harry Potter series was at the top of the list of challenged books in 1999.

The Harry Potter series consists of seven books that follow the life of Harry Potter. At the age of eleven, Harry, who is an orphan child and lives with his uncle, aunt, and cousin, discovers that he is a wizard and that he will attend a school where young wizards and witches learn how to perform magic. Together with his two best friends Ron and Hermione, Harry fights against his greatest enemy Lord Voldemort, the most evil wizard of all times. Voldemort had tried to kill Harry when he was one year old, before disappearing for many years. Harry soon discovers from Albus Dumbledore, the headmaster of his school, that Voldemort will return soon. Meanwhile Harry attends the school and grows into

a very talented and brave man. He fights with Voldemort on his return several times in the series, until he defeats him in the final battle.

The Harry Potter series is completely a fantasy not reality. J.K.Rowling has incorporated all the elements of a good fantasy in Harry Potter to make this work interesting and readable. The series features the struggle between a band of plucky heroes against a dark Lord and his minions. The Dark Lord has previously menaced the world in a prior incarnation and defeated, but is now returning, a fact initially greeted with scepticism in some quarters. The central hero is a chosen one whose destiny is to defeat the Dark Lord, as agreed upon by everyone. The series features conspiracies, political intrigue, and notable magical battles. The series incorporates numerous standard fantasy creatures and monsters, including centaurs, dragons and griffins.

Some critics suggests Rowling's books are popular because they provide an easy escape rather than because of good writing. The reason for the books popularity has to do with Rowling's ability to write in multiple genres successfully. Harry Potter novels do not fall into one genre: there are at least ten different types of stories being told in this novel series. These novels are a gathering point of schoolboy stories, hero's journey epics, alchemical drama, manners-and-morals fiction, satire, gothic romance, detective mysteries, adventure tales, coming-of-age novels, and Christian fantasy. These characteristics of her writing work together to attract readers of all age and of various reading interests.

Fantasy has crossed over from cult fiction for dreamers to main stream consumption, and its market has continued to surge. Fantasy books are not for one particular age group; it attracts the people of all age groups. Due to its increasing popularity, librarians continue to stock their shelves with the newest titles in the latest fantasy series; film producers continue to make millions of dollars on movies based on fantasy books; and, more telling than anything else,

readers continue to read them. Fantasy creates hopes and optimism in readers. The hope and optimism can easily carry over into an adolescent's real life. J.K.Rowling is one of the most popular and successful writer of fantasy literature. She has been hailed as a clever, imaginative writer of books, whose Harry Potter series, have enticed children into reading again.

References:

- [1] Anatols, Giselle Lisa, Ed. *Reading Harry Potter: Critical Essays*, Connecticut: Greenwood Publishing, 2003. Print.
- [2] Forsyth, Kate, *The Witches of Eileanan*, US: Roc, 1998. Print.
- [3] Greenway, Beth "The Morphing of Mollie Hunter", *The Alan Review* 3 vol.23, (Spring 1996).
<http://scholar.lib.vt.edu/ejournals/ALAN/spring96/greenway>.
- [4] Granger, John, *Harry Potter's Book Shelf*, New York: Berkley Trade, 2009. Print.
- [5] Mendleshon, Farah and James Edward, *A Short History of Fantasy*, Middlesex: University Press, 2009. Print.
- [6] *Oxford Dictionary of English*, Oxford University Press, 2010. Print.

Relegated Lives: Mapping the Female Space in Lalithambika Antharjanam's *Agnisakshi*

Jyothsna T. V.

Department of English, St. Paul's College, Kalamassery,
Kochi 683503, India; yoths nabhaskarathu@gmail.com

ABSTRACT

In modern society gender and caste give identity to a civilization. With respect to Indian culture, they give a distinct identity to its women. Women are endowed with the identity of a sacrificial figure with forms like womanhood, motherhood etc. confined to the walls of these forms, women are forced to suppress their desires and emotions. This paper is an attempt to map the relegated life led by the female protagonist in Lalithambika Antharjanam's Agnisakshi.

Key words: Gender, identity, caste, patriarchy

Gender is a term that has psychological or cultural rather than biological connotations. It has been a concern for both society and literature from the ancient times. A caste may be defined as a collection of families or groups of families bearing a common name which usually denotes or is associated with specific occupation, claiming common descent from a mythical ancestor, human or divine, professing to follow the same professional callings and form a single homogeneous community.

Although women have been active agents in the society, patriarchal thought has always tried to relegate them to the margins so as to obscure their

history. Lalithambika Antharjanam presents the struggles and sufferings of women in the discourse of patriarchy through her women characters in the novel *Agnisakshi*. The novel is a feminist attitude towards the search of self-identity of its protagonist. Her protagonist breaks out of a *Namboodiri Illam* and embraces many identities like a social reformer to a Gandhian politician and finally becomes an ascetic. It deals with the problems of the upper class woman who in spite of their belonging to the upper castes enjoyed little freedom. The protagonist of the novel goes through four stages or states of life. As Tethikutty, sister of P.K.P.Namboodiri; as Devaki, wife of Unni Namboodiri in *Manampalli Illam*; then as Devi Behan, who struggles for national liberation and sacrifices her life for national service. Later she becomes Sumitrananda, an ascetic.

In the light of Kate Millet's *Sexual Politics* (1970), cultural discourse reflects a systematized subjugation and exploitation of women. Millet claims that personal relationship between men and women are fundamentally political, and become the paradigm for all other relationships within patriarchy. The term politics in her work refers to power-structured relationships, whereby one group of persons is controlled by another. It is the mechanisms that express and enforce the relations of power in society. Male rules over females as a birth right priority which results in an 'interior colonization'. The principles of patriarchy appear to be twofold: male shall dominate female, elder shall dominate younger (35). In the novel, Aphan Namboodiri embodies the hegemonic power of man, who wants to crush the liberty of the females. He has the central power and his decisions are final in the Illam. Everyone acts according to his will.

...Aphan Namboodiri looked after the family affairs and practically ruled the Illam. Paddy from the best fields of the village poured into the granaries of *Manampalli*. Majestic elephants stood at its gate. The rents from lands were cashed, and the money kept with usurers multiplied with

interest. It was well-known that there was nothing impossible for the powerful and diplomatic Aphan Namboodiri in the land of Kerala. (Antharjanam 24)

Sexual Politics defines politics as a set of stratagems designed to maintain a system. Sexual politics obtains consent through the socialization of both sexes to basic patriarchal politics with regard to temperament, roles and status. Temperament involves the formation of human personality along stereotyped lines of sex category based on the needs and values of the dominant group and finds it convenient to assign stereotyped roles to subordination. Thus docility, passivity and ignorance are virtues assigned to females whereas aggression, intelligence, force, and efficiency are assigned to males. In terms of activity, sex roles assign domestic service and attendance upon infants to the female, the rest of human achievement, interest and ambition to the male. “Women had no history, so they were told and they believed. And because they had no history they had no future alternatives” (Kaur 22).

In terms of activity, sex role assigns domestic service and attendance upon infants to the female, the rest of human achievement, interest and ambition to the male. Role decrees an elaborate code of conduct, gesture and attitude for each sex. As to status, a pervasive assert to the prejudice of male superiority guarantees superior status in the male, inferior in the female. In short, the ideologies of a patriarchal society can be divided into three categories; they are ‘status’ as the political component, ‘role’ as the sociological component and ‘temperament’ as a psychological component.

Devaki, in *Agnisakshi*, is born and brought up in a *Brahmin* family which is liberal in its outlook and viewpoints. She is educated and from her brother P.K.P.Namboodiri she accessed books and magazines. But her life has changed when she became the wife of Unni Namboodiri in *Manampalli Illam*. Her

marriage demands confinement into the four walls of the Illam. Her husband has failed to understand her. “The lives of *Namboodiri* women should be confined to the precincts of the kitchen and prayer-room” (32).

According to Devaki there is no guarantee that Unni won't become a mendicant. He has married her to have a successor in the family. Now he is on his phase of grihathashrama. He needs a wedded partner for his religious rites. Even at night time, he used to enter the old custom at Manampalli Mana. Unni's mother is a typical Namboodiri woman. She accepts the orthodox rigid rules and manners of the patriarchy. She is very particular in sticking on to all kinds of routine and customs. Unni decides to be a brahmachari for one full year as a part of the death rite of Mad Aunt, the wife of the elder Aphan Namboodiri. Thus there is no sexual relationship between Devaki and Unni. Devaki is completely ignored by her husband. She never gets her husband according to her wishes. She has to suppress her sexual desires. Unni doesn't consider her.

Simon de Beauvoir explains that women have always occupied a position unique among the oppressed sections of mankind. It is evident in Devaki's words:

I do not represent any particular community, religion or society. I am the representative of the womenfolk who have been subjected to suffering for centuries. Looking at this truth which stands before you, the veil discarded, you may curse or bless. But this load of sorrow which is our very own was your creation... Remember that. (Antharjanam 70)

Unlike all other oppressed categories women are numerically equal to their oppressors, men. Unlike those persecuted on grounds of race (African-Americans or Jews) women do not have a shared history. Unlike those oppressed

on grounds of class (the proletariat) women have always existed. The subordination of women is not the result of a particular historical event.

Women lack concrete means for organizing themselves into a unit which can stand face to face with the correlative unit. They have no past, no history, no religion of their own, and they have no such solidarity of work and interest as that of the proletariat. Women cannot ever dream of exterminating the males. The bond that unites her to her oppressors is not comparable to any other... Male and female stand opposed within a primordial 'Mitsein' and woman has not broken it. (Beauvoir 19)

Devaki does not get a good family life. For Unni, her husband, life is a prolonged penance. He is of the opinion that a *Brahmin* has to live for others rather than for his own happiness. His life is based upon Dharma. He gives preference to his duties and families not his wife Devaki. Even the sweet voice of Unni makes Devaki happy. But Unni deliberately ignores Devaki's needs as a wife for the sake of rituals and rites.

Devaki is conditioned to her family life. Unni and Devaki are living under the same roof as strangers. Devaki's atmosphere or circumstance breeds rebellious thoughts in her mind. She begins to act according to her mind. This leads her to go back to her *Illam* for the last rites of her mother by ignoring the protest of her husband's family. She wears sari, which is against the dress code of her caste. Thus she is excommunicated from her caste by her husband's *Illam*. Unni remains silent by viewing all these things.

Thus a *Namboodiri* woman, who used to go about holding an umbrella, head bent, body fully covered comes in front of the public and strives for the liberation of her nation, for the liberation of womenfolk. Devaki takes courage from her state of being a subjugate person. "Only they will have so much

courage, because they have suffered quite a lot. Only a volcano can erupt and burst into flame like that" (69).

Patriarchy's chief institution is the family. It is both a mirror of and a connection with the larger society; a patriarchal unit within a patriarchal whole. Meditating between the individual and the social structure, the family effects control and conformity where political and other authorities are insufficient. As the fundamental instrument and the foundation unit of patriarchal society the family and its roles are prototypical. Serving as an agent of the larger society, the family not only encourages its own members to adjust and conform, but acts as a unit in the government of the patriarchal state which rules its citizens through its family heads. Even in patriarchal societies where they are granted legal citizenship women tend to be ruled through the family alone and have little or no formal relation to the state.

Traditionally, patriarchy granted the father nearly total ownership over wife or wives and children, including the powers of physical abuse and often even those of murder and sale. In *Agnisakshi*, Aphan Namboodiri holds the central power. The chief contribution of the family in patriarchy is the socialization of the young into patriarchal ideology's prescribed attitudes toward the categories of role, temperament and status. Socialization and reproduction are the two central functions of the family. In the novel family has a central position. Everything takes place in family. The family in *Agnisakshi* is a joint family. In such type of families women have to suffer very much. They have to remain silent against the domination of males for the sake of their families. They were considered as mere sexual objects by their husbands and sometimes they were ignored by their own husbands after having children.

Devaki cannot afford all these unnecessary evils for the sake of her family life. Actually she does not belong to the *Manampalli* family, where the

stubborn, down-to-earth Iravi Ravi Namboodiripad ruled, and women like Elder Aunt, younger Aunt and orthodox granny, a group of custom-bound, die-hards controlled the affairs of the women's quarters. Devaki is not the type of a woman who should have become the wife of a mild tempered and extremely tolerant Unni Namboodiri. She bears a huge amount of suffering. And she thinks that all the sufferings of the world are hers too.

The Namboodiri women in the *Illam* are conditioned to the orthodox patriarchal system. So they never try to change their mind and life and they cannot accept the thought-provoking words of social reformers like P.K.P.Namboodiri. The male members in the family use this subordinate state of mind of the women as a device to maintain their domination. The social norms, values, law and cultural practices of patriarchy demanded, imposed and recommended particular forms of behaviour from women; and not conforming to these norms resulted in their being treated as witches. Thus women consented to feminine roles and to their on subordination.

There is an instance in the novel which shows this state. P.K.P.Namboodiri, Devaki's brother, exhorts that Namboodiri women should get rid of their umbrellas. During that time a Namboodiri woman without an umbrella and moving freely with the untouchables is considered as a prostitute.

Namboodiri women in Kerala are used to observe 'Purdah' of a kind. 'Purdah' can be considered as a symbol of women's subjugation-or suppression. It limits their freedom. Whenever the Namboodiri women went out, they had to carry an umbrella made of Palmyra leaves to cover their faces. The married women never used to look at men's faces, other than their husbands. Generally it was considered that all good *Namboodiri* women would carry the umbrella as a symbol of their culture. P.K.P. also says Namboodiries need not wear the sacred thread and no segregation on social grounds. The old timers consider him an

outcaste. Everyone including grandmother and Aphan Namboodiri would say, "What a pity this had to happen! Why did we have to choose as bride this man's sister- this man, who mixed with untouchables, ate with them, broke the sacred thread and kept company with low castes and Muslims"(Antharjanam 42).

Devaki is growing and gradually reaching greater heights. If she has not been born as a Namboodiri woman, she would have reached a higher place than her own husband and brother. Women are not a mere idol or a wooden doll. She needs lots of support to grow. She needs a man to love. According to the *Manusmriti* a woman is protected by her father in her childhood, by husband in youth and by son in old age. A woman is protected but she is not understood by anyone of these persons. Rebellious reawakening against male domination is attempted and Devaki is a victim of rigidity and narrow-mindedness of elders which suffocate her.

A woman's life is always hampered. *Agnisakshi* is an example of this statement. The novel is a remainder for an era consisting of the past fourth years of social and political changes. The novel was against the background of the particular community. But many common problems which prevailed in the social life of those days are also indicated in it.

Sister Tethi, Devaki Manampalli and Devi Behan reveal the three faces of the life of Sumitrananda, an ascetic. Transformation from Tethi to Sumitrananda is a long journey of struggle. Sumitrananda is the epitome of the emancipation of woman. Here we can see the emergence of a new woman who breaks free from the worldly pleasures and life. But the spotting point is that she cannot lead a normal life. This shows the fact that a new woman is not fit into the current life. Liberation from submissive tendency and compromised mentality of women only, can bring about radical changes in the long run.

References:

- [1] Beauvoir, Simon de, *The Second Sex*, H.M. Parshley, Harmondsworth: Penguin Books, 1976. Print.
- [2] Kaur, Iqbal, ed, *Gender and Literature*, NewDelhi: DK, 2008. Print.
- [3] Lalithambika, Antharjanam, Agnisakshi, Tr. Vasanthi Sankaranarayanan. Trissur: Kerala Sahithya Academy, 1980. Print.
- [4] Millet, Kate, *Sexual Politics*, New York: OUP, 2005. Print.

Deconstruction of Sita-Shoorpanaka Binary: Panimalar, a Unique Representation

Sanooba Ali

Department of English, St. Paul's College, Kalamassery,
Kochi 683503, India; sanoobaali91@gmail.com

ABSTRACT

Cinema is the most popular contemporary art form, which always allows a wide spectrum of possibilities in exploring human minds and societal norms. As a socially concerned art form it works on ideological premises prevailing in the filmmaker's conscience. Among the diverse outcomes that emanate from a movie, prejudices or more clearly stereotypical assumptions are induced into the audience's mind according to the filmmaker's will. In Indian cinema, gender based stereotyping of woman has been modelled on the epic characters Sita and Shoorpanaka since its beginning. Explicitly or otherwise, Bollywood and all other regional language film industries have the same patterns of stereotyping. But Panimalar, the heroine character in the 2013 Tamil movie Maryan simultaneously deconstructs and merges these binary oppositions of "good woman" and "bad woman". This paper tries to understand the intricacies of the non-stereotypical depiction of Panimalar.

Key words: visualization, criticize, analyse, female characters

Indian cinema celebrated its hundredth birth anniversary in 2014, a year which has also seen experimental as well as realistic "productions" almost in all regional language industries and Bollywood. By this first century of the cinema on the Indian soil, it has turned out to possess a cut and dried space in the life of

Indians. In the contemporary world, this fast growing “hybrid art”- cinema as an art form comprises almost all possible artistic talents and influences spectators visually and audibly. Every cinema release is a time for celebration for common movie goers and abrasive blather for various fans associations. For a majority of movie-goers, cinema is a form of entertainment and pastime, a product that creates new trends and sets fashions frequently. Even though things are changing, cinema is a discourse which fabricates super heroic portrayals of super stars- the most attractive part for its fan followers.

Looked at closely, cinema does not seem as innocuous as it appears on the surface. If a single movie can capture the attention of people and make them accept new styles, it is obvious that it does not always work on entertainment value alone. Like every art form cinema too has its code. As mentioned earlier, it is a production industry in which the products are the result of ideas or rather ideologies of the brains working behind it. Every single technique in cinema has its own purpose. Images, sounds, setting, lighting, costumes and language that the characters speak are equally relevant ingredients which help to win over the minds of the audience, in whatever manner the director wants to, without their being conscious of it. Cinema, arguably the most popular contemporary medium, represents a wide spectrum of issues and concerns in front of an audience as if it were real. This make believability of visualisation stands as one of the best and beautiful parts of its production. Among the diverse outcome that emanate from a movie, prejudices or more clearly stereotypical assumptions may possibly smash into a reflexive audience’s mind.

Stereotyping, which does not acknowledge individual variation, is an exaggerated or distorted generalization about an entire category of people. It is part of cinema as it works in the fiction which sometimes glorifies or eulogises characters/ a community and at other times marginalizes or criticises, in

accordance with the ideology at work in its making. World cinema, particularly Indian cinema, has witnessed various levels of typecasting on the basis of gender, race, nationality, religion, and cast. Of these, gender stereotyping is a universal one. Negating a chance for doubt, the dominant ideology prevailing on gender based stereotyping which represents women, according to man's will is patriarchal. In the Indian context, the epic characters Sita and Shoorpanaka are the typical models of the so called good woman and bad woman images- that have roots in Indian patriarchal society. If sacrifice, patience and fidelity are "key qualities" of characters modelled on Sita, characters modelled on Shoorpanaka have aggressiveness, impatience, and expression of sexual instincts as key traits.

Directly or indirectly, the themes of the epic still pervade Indian cinema as characters modelled on Shoorpanaka run after the hero showing sensuality whilst characters modelled on Sita remain chaste and do not express any kind of natural sexual instinct even towards the husband. The common psychology which shapes these portrayals regard the former as standing for man's fantasies and the latter as being an idealised representation of a woman whom a man wants to possess. To put it clearly, the maker's perception of the woman anchors the structure of representation within the limits of the screenplay. He desires to be chased by a woman who is attracted by his manliness and at the same time he also wishes to be the man of a woman with all "purity". These kinds of representation have their life along with the history of the cinema, but are not always explicit. The terms of existence of the women characters have shifted from time to time taking different stances. The "item number dances", whose earlier form was cabaret, are a very popular form of showcasing the woman's body and nowadays reveal the aforementioned whimsies.

Though female representation builds on, to adopt Laura Mulevy's terms, male gaze and to-be-looked-at-ness, and Sita/ Shoorpanaka models, there are

some exceptions. The hundredth year of Indian cinema has witnessed such a product from Kollywood, an industry which constantly creates chances to enjoy the female body through gazes that sometimes cross even the limits of screenplay. In *Maryan*, a 2013 movie directed by Bharat Bala, the story revolves around title character Maryan (Danush) and his love Panimalar (Parvathy) living in Neerodi, a coastal village in Tamil Nadu. The movie has been exquisitely shot in two hugely contrasting locations - the rich coastline of South India with its dramatic beauty, and barren locations of the deserts of Africa. The movie as a product clearly showcases talents of off screen technicians including the director and on screen actors. For the time being the lady lead, Panimalar is the only concern.

Panimalar has been in love with Maryan when the flash back begins. She is special because Panimalar is a point where the characteristic features of depictions modelled on Sita and Shoorpanaka deconstruct and merge. The oddities of Panimalar visually are revealed from the introductory scenes when she doesn't shy away from confessing her love to Maryan. Panimalar shows a kind of aggressiveness and impatience to fix a place in, what Maryan himself calls, his "empty heart". Before moving to analyze the unique intricacies of Panimalar, her appearance also needs scrutiny. She used to wear plain *davani* or skirt and blouse without embellishments. Being a coastal village girl, she belongs to the lower class and wears the same dress twice or thrice in the movie which also shows the perfection of direction. The anklets used by Panimalar take hold of audience's interest for a moment of time, in the footwear scene outside the church, which also has connotations. Some scenes of her household chores are sure to create resonances in the Malayali spectator's mind about the strong female characters of Malayalam cinema in its infancy. In those days, actors lived their roles in cinema whether it was cleaning the courtyard or cleaning fish. Parvathy has faultlessly acted out such scenes of cleaning and cutting the fish

like someone who does it daily. Panimalar's mannerisms while dealing with fish affairs seem that Parvathy is a method actor.

This character can be analysed in the light of deconstructing conventional portrayals of female characters. The aim of this paper is not to state that Indian cinema has only seen female characters built on the Sita-Shoorpanaka binary, and Panimalar is the only exception. But Indian cinema has traces of epic themes and stock characters modelled on epic characters. Even though exceptions are always there like bold female representations, Panimalar is distinct by virtue of possessing behaviour patterns of both Sita and Shoorpanaka. Panimalar as a character deconstructs the oppositional binaries like good and bad. The dress she wears puts forth a statement that, it is quite impossible to judge human being solely on the basis of the outfit s/he uses. Panimalar uses *davani*, but she is not a shy, soft or submissive girl. Generally, in the Indian scenario anklets have somewhat symbolic representations, traditionally either hinting at the tenderness of a girl or signifies the local prostitute who wears it along with a big red *bindi*, glittering ornaments, and hair decorated with various colours of sweet smelling flowers. Here also, the character Panimalar goes beyond typecasting.

Panimalar deconstructs the expected behaviour of a girl in love. The story of Panimalar- Maryan love unravels through the flashback as mentioned. When the cinema begins Maryan is in Sudan and Panimalar in their native place where she awaits her beloved's return with the patience of Sita. In the flashback scenes she is passionately in love with Maryan but sadly her feelings are not reciprocated at the initial stage. She pursues him in whatever manner it is possible. Amazingly, she tries to enter his heart through the stomach by offering meals with fish. Panimalar is very active and assertive throughout her endeavour of chasing Maryan to make him fall in love with her. She maintains the same

boldness and aura of her personality before and after Maryan falls in love. She is confident and bold enough to say, while looking closely at her beloved's eyes, "I have seen it in your eyes. Come what may... you are mine." This happens even before Maryan discloses his heart. There is a scene in the song *Enne koncham neram irunathalum enna...* in which Panimalar covers her face with Maryan's dhoti and enjoys the physical closeness. It can be analysed as the rarest of scenes because usually in cinema the man smells the odour of the female body, not the other way.

While male gaze is acceptable and common in Indian cinema, female gaze is very rare and is acceptable only from Shoorpanaka like characters. Indian cinema has denied similar privileges to women characters specifically in the matter of lust. Male characters, whether he is the hero or the villain, have the opportunity to enjoy the curves of the female body, thus celebrating objectification of female body. A female gaze by characters modelled on Sita is exceedingly rare in Indian cinema. But Panimalar is different; she looks at Maryan exploring the vast possibilities of the female gaze. Traditionally, the "bad woman" gazes in such a way and obviously situations never allow her to possess whom she gazed. Apparently, in the representation of Panimalar the intervention of patriarchal prejudices and norms is very little.

Panimalar keeps her fidelity towards Maryan not because it is imposed upon her. A noticeable feature in the screenplay is that the myth connecting the virginity/chastity of a woman living in coastal area with sea goddess's fury is not reiterated. The movie gives an insight that love and mutual respect should have been the reason for loyalty not rules. The screenplay has somewhat given equal importance to the title character Maryan and his love. An extremely low angle shot taken from the coast in which Panimalar stands on the top of a tower is allotted to Panimalar in one of the scenes in the song *Enke ponna rasa, Saayam*

kaalamaach... A woman at a height waiting for her love to return from the stormy sea is the scene. Usually this kind of shot is not given to female characters, only their male counterparts are allowed to conquer heights.

Panimalar is a new face, a deconstruction of filmic representation of female manners, behaviour and fate. With a noticeable lack of patience Panimalar longs for Maryan aggressively but when the time comes she waits for him patiently. In the end, the girl who ran after the man like Shoorpanaka, keeps her loyalty and like Sita gets back her love. To sum up, Panimalar is a different female self in screenplay, direction and acting. Panimalar sows new hopes of female representation. With changing life style, changing world, changing techniques, changing perceptions, we need changing representations too because as observed earlier cinema is the fastest growing communication medium in the contemporary world.

Note: Method acting, is a group of techniques actors use to create in themselves the thoughts and feelings of their characters, so as to develop lifelike performances.

References:

- [1] *Maryan*, Screenplay by Bharat Bala and Sriram Rajan, Dir. Bharat Bala. Perf. Danush, Parvathy and Salim Kumar, Aascar Film Pvt. Ltd, 2013, Film.
- [2] Mulvey, Laura, "Visual Pleasure and Narrative Cinema" *Visual and Other Pleasures*, UK: Palgrave Macmillan, 2009. Print.
- [3] Hollinger, Karen, *The Actress: Hollywood Acting and the Female Star*, London: Taylor and Francis, 2006. Print.

आदिवासी स्त्री - शाक्तीकरण –
नगाडे की तरह बजते शब्दों के द्वारा

Beena P. J.

Department of Hindi, St. Paul's College, Kalamassery,
Kochi 683503, India; beena.puthukudy@gmail.com

ABSTRACT

एक आदिवासी संताल परिवार में जन्म लेनेवाली निर्मला पुतूल उन स्त्रियों से हमारा परिचय कराती है जिनमें से कुछ सामान्य स्त्री की चारित्रिक विशेषताओं से भरी हुई है तो बहुतया आदिवासी स्त्रियाँ हैं जो अपने भोलेपन और अज्ञानान्धकार की तह में गिरी पडी हैं। इनके बीच निर्मला पुतूल एक दीप्त सूर्य के समान प्रज्वलित रहती है जो कभी कभी अपनी सहेलियों को भविष्य की रास्ता दिखाती है तो कभी कभी अपने आप को मोर्चा के योद्धा स्थापित करती है।

Key words: दस्तावेज़, मगजहीन

स्त्री चाहे वह आदिवासी हो या नगरी, पढी-लिखी हो या अनपढ, स्वदेशी हो या विदेशी एक ही अहं को ढोनेवाली है। उसकी अस्मिता, उसकी चिंतार्ये, उसकी तलाश, उसकी बेचैनी, उसका मौन सब एक जैसा रहता है। स्त्री का स्वत्व, प्रापंचिक रहस्य जैसा है जिसे कोई भी पूर्णतया समझ नहीं पाता। शायद स्वयं एक स्त्री भी अपने को पूर्ण रूप से समझ नहीं पाती। यह एक तथ्य है। यह सार्वलौकिक तथ्य उसकी चेतना पर इतना जम गयी है कि उससे बचना या बचकर अपने में डूब जाना उसके वश की बात नहीं बन गयी है। वह जहाँ भी हो, जैसी भी हो एक पूर्व-निर्धारित पथ पर जाने या अनजाने चलती रहती है। संसार में ऐसी भी स्त्रियाँ होती हैं जिनकेलिए जिन्दगी हर्ष, उल्लास और आवेगों से भरी पूरी मिलती है। मगर इस हर्ष और उल्लास के पीछे बडे बलिदान और समर्पण पाये जाते हैं जिन्होंने

उनकी अस्मिता को हमेशा के लिए विनष्ट कर दिया है। दुनिया में ऐसी भी स्त्रियाँ हैं जिन्हें अपने व्यक्तित्व को पूर्णतया विकसित करने का रास्ता खुला मिला है। पर उनकी संख्या बहुत कम है। संसार की अधिकांश स्त्रियाँ विशेषकर वे जो अविकसित या विकासवान देशों में बसती हैं, अपनी अस्मिता खो बैठी हैं। आदिवासी स्त्रियों की हैसियत इनसे भी कितने ही बदतर है।

एक स्त्री रचनाकार की बखूबी यह है कि वह स्त्री के अस्तित्व और व्यक्तित्व को गहरई से समझ पाती है। निर्मला पुतूल की बखूबी का आधार भी यही है। वह स्त्री की कमजोरी को समझती है, साथ ही साथ उसकी शक्ति को भी पहचानती है। एक आदिवासी संताल परिवार में जन्म लेनेवाली निर्मला पुतूल उन स्त्रियों से हमारा परिचय कराती है जिनमें से कुछ सामान्य स्त्री की चारित्रिक विशेषताओं से भरी हुई है तो बहुतरा आदिवासी स्त्रियाँ हैं जो अपने भोलेपन और अज्ञानान्धकार की तह में गिरी पड़ी हैं। इनके बीच निर्मला पुतूल एक दीप्त सूर्य के समान प्रज्वलित रहती है जो कभी कभी अपनी सहेलियों को भविष्य की रास्ता दिखाती है तो कभी कभी अपने आप को मोर्चा के योद्धा स्थापित करती है।

“नगाडे की तरह बजते शब्द” नामक अपने प्रथम कविता संग्रह की पहली कविता “क्या तुम जानते हो” में कवयित्री ने स्त्री की अहमियत की ओर इशारा की है। पुरुष से भिन्न स्त्री के स्वत्व की विभिन्न पहलुओं का विशेषण करके वह पूछती है कि ऐसी स्त्री को क्या तुम जानते हो? पुरुष वर्चस्ववादी समाज में कौन स्त्री की परवाह करती है या इसके व्यक्तित्व को समझने की कोशिश करता है। उसका एकान्त, उसकी वेचनी-सब कुछ पुरुष से भिन्न है। अपनी कल्पना में एक ही समय में अपने को स्थापित और निर्वासित एवं रिश्तों के कुरुक्षेत्र में अपने आप से लड़नेवाली स्त्री को कौन जानता है? सब लोग स्त्री के तन को जानते हैं, मगर उससे परे इसके मन में खौलते इतिहास को जानने की कोशिश किसी ने नहीं की है। समाज स्त्री की चुप्पी चाहता है। पर स्त्री कुछ बोलना चाहती है। शब्दों की तडप से भरे हुए उसके चेहरे को किसी ने देखा नहीं है। फिर कवयित्री समस्त पुरुष वर्गों से यह पूछती है कि स्त्री के अन्दर अपने वंश बीज बोते, उसकी फैलती जड़ों को अपने भीतर कभी महसूस किया है? उसके चारों ओर फैले

रिश्तों को उसके अपने महत्व के साथ किसी ने समझा है। पुरुष हमेशा अपनी दृष्टि से स्त्री को परखता है, कभी भी स्त्री की दृष्टि से स्त्रीत्व को समझने की कोशिश नहीं करता है। पुरुष के लिए वह केवल बिस्तर और रसोई की वस्तु मात्र बन गयी है। इस गणित के परे एक स्त्री के बारे में वह कुछ नहीं जानता। इस कविता में निर्मला पुतुल ने स्त्री को केवल भोग्य वस्तु माननेवाले पुरुष वर्चस्विता पर प्रश्न किया है।

“अपनी ज़मीन तलाशती बेचैन स्त्री” में कवयित्री कहती है कि अब स्त्री अपनी ही दुनिया को पुरुष की दृष्टि से देखने के लिए अभ्यस्त हो गयी है। इसकी अपनी दृष्टि ही नहीं रह गयी है। हर बेचैन स्त्री हर रोज़ अपने को तलाशती है। घर, प्रेम और जाति से अलग होकर वह ऐसी एक ज़मीन खोजती है जो सिर्फ उसकी अपनी हो। स्वतंत्र आकाश में उसके होने का आभास देना वह चाहती है। कवयित्री स्पष्ट करती है कि यथार्थ में एक स्त्री जितना अधिक धिरती जाती है उतना ही वह अमूर्त होती चलती है।

‘आदिवासी स्त्रियाँ’ नामक कविता, दरअसल, आदिवासी स्त्रियों का एडेन्टिफिकेशन है। अज्ञता उनकी एडेन्टि है। अपनी ही जाती की स्त्रियों की इस विवशता को उन्होंने खुले ढंग से प्रस्तुत किया है। अपनी सीमित दायरे में जीनेवाली आदिवासी स्त्रियों की ज़िन्दगी केवल अपनी आँखों की पहुँच तक ही है। बाहरी दुनिया के बारे में वह कुछ नहीं जानती। वे नहीं जानती कि इस दुनिया में उनकी जैसी कई कई दुनियायें शामिल हैं। उनकी बनाई चीज़ें, उनकी तस्वीरें कैसे महानगर दिल्ली तक पहुँचती हैं, वे नहीं जानती, क्योंकि उनकी दुनिया की पगडंडियाँ राजमार्ग पहुँचने के पहले ही दम तोड़ देती है। “बाहामुनि” में भी उनकी भोलेपन झलकती है। उनके हाथों से बने पत्तल पर हज़ारों अपना पेट भरते हैं, पर हज़ारों पत्तल बनाने पर भी उनका पेट भर नहीं जाता है। बड़े बड़े घरों और महलों के फर्श को सुन्दर बनानेवाला या बड़े बड़े लोगों को विश्राम देनेवाली चटाइयाँ वे कच्ची ज़मीन पर बैठकर बुनती हैं और दूसरों के लिए पंखा बनाते बनाते उनके शरीर से पसीना टप टप बरसता है। उन्हें पता ही नहीं होता कि जब वे दातुन कर रही होती तब तक सैकड़ों उनके ही दातुन से हाथ-मूँह धोकर भोजन-पानी कर चुके होते हैं। दूसरों के घरों को साफ करनेवाली झाड़ू बनाते बनाते वे नहीं जानती कि अपनी ही बस्ती कूड़ा-कचरों से भर जाती

है। वे इतनी भोली-भाली है कि बाहरी दुनिया उनकी सोच से कितनी दूर है। उनके भोलेपन और सौन्दर्य का और भी स्पष्ट बयान है “आदिवासी लडकियों के बारे में”। इस कविता में निर्मल पुतुल एक बड़ी सच्चाई को लोगों के सामने रखती है कि वास्तव में, आदिवासी स्त्रियों के भोलेपन का शोषण करनेवाले लोग अपनी ही जाति के पुरुष हैं। उनके बारे में झूठ बतानेवाले, उन्हें उपहास करने वाले लोग उनके ही अपने आदमी हैं। कवयित्री ने उन्हें सच्चाई को धुन्ध में लपेटनेवाला कोई निर्लज्ज सौदागर कहा है। वह शंका करती है कि यह तो कोई ऐसा कवि होगा जो मस्तिष्क के अपाहिज हो।

कवयित्री हमेशा अपनी जाति की स्त्रियों के पक्षपाती है, वह यह कहने में डरती भी नहीं कि अपनी ही जाति के लोग अपनी ही स्त्रियों के खलनायक बनते हैं। वह लोगों के सामने यह भी पेश करती है कि आदिवासी स्त्रियाँ कितनी भोली भाली और सीधी-साधी हैं। वह ऊपर से काली है तो भी भीतर से चमकते दाँतों की तरह शान्त और धवल होती है। जब वे हँसती हैं तो लगता है फेनिल दूध सी, पहाड की कोख में मीठे पानी के सोते झर-झर कर झरते हैं। जब वे हरी पीली पत्तियाँ जूड़े में खोंसती हैं तो ऐसा प्रतीत होता है जैसे असमय ही वसन्त ऋतु आयी है। जब वे खेतों में फसलों को रोपती या काटती हुई गाती हैं तो ऐसा कहा जाता है कि जिन्दगी के दर्द भूल जाती है।

“पहाडी स्त्री” एक मेहनती पहाडी स्त्री का दस्तावेज है। कवयित्री बयान करती है कि एक आदिवासी स्त्री कैसे अपने घर-परिवार संभालती है। वह पहाड से सूखी लकड़ियों का गट्ठर सिर पर लादकर बाज़ार जाती है और उन्हें बेचकर परिवार की भूख मिटाती है। जब वह चादर में बच्चे को पीठ पर लटकाये धान रोपती है तो प्रतीत होता है कि उसका पहाड-सा सुख कल के सुख की लहलहाती सुख के लिए रोप रही है। पहाड पर चटाइयाँ बुनते उनका पहाड सा दिन ढल रहा है। जब वह झाडू बनाती है तो लगता है गन्दगी से लडने के हथियार बनाती है। गाय-बकरियों के पीछे भागते उनके पाँव धरती पर सैकड़ों कुँवारे गीत रचाते हैं।

पुरुष की परंपरावादिता या शोषण नीति पर स्त्री के प्रतिरोध की आवाज़ “मैं वो नहीं हूँ जो तुम समझते हो” नामक कविता में हम सुन सकते हैं। पारंपरिक स्त्री, पुरुष की नज़र में अबला और चंचला है। स्त्री की इस चंचलता का या यों कहे कि भोलेपन का पुरुष हमेशा शोषण करता रहा। पर आधुनिक स्त्री चाहे वह आदिवासी स्त्री क्यों न हो प्रतिरोध की दीवार उठाने लगी है। शोषण को पहचानकर उसके विरुद्ध लड़ने को तैयार होनेवाली स्त्री प्रगति की ओर कदम रखी भारतीय स्त्रीत्व का प्रतिनिधि है। अपनी विवशता को समझना, उस विवशता पर विजय प्राप्त करना, फिर दुनिया के सामने आवाज़ बुलंद कर देना-ये विकास की प्रक्रियायें हैं। दरअसल, इसे ही स्त्रीवाद के नाम से पुकार सकते हैं। इस तरह निर्मला पुतुल स्त्रीवादी साहित्यकार बन जाती है। पुरुष जितना भी आधुनिक हो तो भी स्त्री के आगे उसका लजीलापन खतम नहीं होता। अपने लजीलापन की तृप्ति के लिए वह स्त्री के चंचलेपन का लाभ उठाता है। मीठी-चुपड़ी बातें, अनचाहे मदद, बिन माँगी सलाहें, झूठी तारीफ आदि पुरुष की जालें हैं, स्त्री को फँसाने की। पर सचेत नारी बनकर वह चेतावनी देती है कि मैं इसे पहचान सकती हूँ। इस नकली सौहार्द के पीछे रहनेवाले ढोंग को, छिपाने की कोशिश में बाहर आती असलियत को पहचान सकती हूँ। आज की स्त्री इतनी जागरूक है कि वह हमेशा इसी ताक में है कि पुरुष की कमज़ोर नसें कहाँ कहाँ हैं ताकि ठीक समय पर, ठीक तरह से वह हमला कर सके। आजकल की स्त्री अपने वार को बेकार नहीं होने देती। यह कविता निर्मला पुतुल के निडर, निर्भीक और विद्रोही दिल का बर्हिस्फुरण है। ये पंक्तियाँ देखिए -

“मैं चुप हूँ तो मत समझो कि गूँगी हूँ
या कि रखा है मैं ने आजीवन मौन-व्रत
गहराती चुप्पी के अँधेरे में सुलग रही है भीतर
जो आक्रोश की आग
उसकी रोशनी में पढ रही हूँ
तुम्हारे खिलाफ अकेले लड़ने के खतरों का लेख।”

“एक बार फिर” नामक कविता में दुहरानेवाले अन्तर्राष्ट्रीय महिला दिवस समारोह पर व्यंग्य है। कवयित्री की मान्यता है कि स्त्री अब भी उसी हालत से गुजर रही है जब इन समारोहों का बोलबाला नहीं था। महिला दिवस समारोह का आयोजन हर वर्ष एक ही तरह का हो जाता है। उसमें किसी प्रकार का अन्तर दिखाई नहीं पड़ता है। इसमें कवयित्री ने उन महिलाओं पर व्यंग्य किया है जो आधुनिक पोशाक पहनकर जुलूस का नेतृत्व करती हैं और स्त्रियों का प्रतिनिधित्व करती हुई मंच पर आसीन होती हैं। व्यवस्था के विरुद्ध माइक पर चीखते वक्त उन्हें दूसरों की तालियों की ज़रूरत पड़ती है और हाथ उठाकर साथ होने का भ्रम भी देती है। वे हमेशा की तरह शब्दों के आरोहण-अवरोहण के माया-जाल में फँसकर संसद की गलियारों में ले जाती हैं और वहाँ हमेशा, की तरह पुरुषों के अहं से टकराकर महिलाओं के मुद्धे और सपने चकनाचूर हो जाते हैं। माननीया मुख्यमंत्री को देखकर स्त्रियाँ गौरवान्वित हो जाती हैं और एक बार फिर दहेज-हत्या, बलात्कार, यौन-उत्पीडन, वेश्यावृत्ति आदि के विरुद्ध मोर्चाबन्दी कर लड़ने का आह्वान देती है। फिर पुरुष सत्ता के खिलाफ अपनी ताकत का सामूहिक प्रदर्शन करते गली से गुजर जाएँगी। एक बार फिर शहर की सुन्दरता में मन पुलकित हो जाएँगे। सबसे बड़ी विडंबना यह है कि जहाँ साधारण स्त्रियाँ शहर की भीड़भरी चौराहे पर खड़ी होकर अपने अधिकारों के लिए उत्तेजक नारे लगाएँगी वहाँ के पोस्टरों में चिपके सिने-तारिकाओं के अश्लील चित्र उन्हें ठेंगा दिखाएँगे। दरअसल, ये चित्र देखकर उनके भीतर की आग ठण्ड पड़ जाती है और हमेशा की तरह वे अपने पति और बच्चों की इन्तज़ार में चौराहे पर छितरा जाएँगी। कवयित्री का इशारा है कि समारोह के मनाये जाने पर भी स्त्रियों की हैसियत बढ़ नहीं जाती है। इन समारोहों के ज़रिये कुछेक लाभ उठाती हैं और बहुमत जैसी की तैसी रह जाती है। समारोह सामान्य स्त्री जनों तक सीमित रह जाता है और फिल्म लोक की अभिनेत्रियाँ अपने आपको शोषण का शिकार बनाकर पैसा बटोरने का काम करती हैं। दहेज हत्या, बलात्कार, यौन-उत्पीडन और वेश्यावृत्ति में अब भी कोई कमी नहीं आ पड़ी।

“पिलचू बूढ़ी से” नामक कविता एक ओर आजकल के समाज में स्त्री की पतित अवस्था का बयान करती है तो दूसरी ओर ऐसी एक ज़माना की

ओर याद दिलाती भी है जहाँ स्त्री धरती की स्वामिनी थी, पुरुष उसका जितना आदर करता था। आज पुरुष द्वारा स्त्रियों पर होनेवाले अत्याचार को देखकर कवयित्री की यादें पुराने ज़माने की आदिवासी आदर्श दंपति पिलचू बूढ़ी और पिलचू हाडाम की ओर जाती है जिन्होंने एक दूसरे को बहुत प्यार किया था। अपनी पत्नी को रिझाने के लिए तथा इसे एकदम सुखी बना रखनेके लिए पति पिलचू हाडाम क्या क्या करता था। अपनी पत्नी को इसने पूरी धरती की स्वामिनी बनायी। पर अब ज़माना बदल गयी है। स्त्री केवल पुरुष की भोग्यवस्तु बन गयी है या मन बहलाने की वस्तु बन गयी है। अपनी इच्छा-पूर्ति के लिए पुरुष एक को छोड़कर दूसरी और तीसरी को भी उठा लाता है। समाज में स्त्री का स्थान नगण्य-सा बन गया है। कवयित्री कहती है कि आजकल के पुरुषों को देखकर यकीन नहीं होता कि ये मगजहीन उन्हीं के ही वंशज हैं।

“आस-पडोस के-छोटे भाइयों से” नामक कविता में उसके मन की आशंकायें व्यक्त हैं। वह अनुभव करती है कि समाज में स्त्रियों की जिन्दगी सुरक्षित नहीं है। उन्हें रक्षक चाहिए। वह अपने भाइयों से, अपने को नोच-खसोट करनेवाले समाज के उन दुष्चरित्रवाले बाघों से रक्षा करने का आह्वान करती है।

“सुगिया” नामक कविता को वह इसलिए लोगों के सामने रखना चाहती है कि लोग जाने कि पुरुष की चाह स्त्री-शरीर पर कितना जम गयी है। स्त्री कितनी ही गुणवती हो, पुरुष की नज़र हमेशा उसकी देह पर है। वह उसकी हाँठ, उसके दाँत, उसका गाना-नाचना, उसकी आँखें सब कुछ का स्तुतिगान करता है। पहाँ तक कि पास आकर कान में चुपके से कहेंगे कि मुझसे दोस्ती करोगी तो तुम्हें सोने की सिकड़ी बनवा देगा। कवयित्री इसे देह की भाषा बताती है और पूछती है कि क्यों हर पाँचवाँ आदमी उससे उसके देह की भाषा में बतियाता है। विशेषकर आदिवासी स्त्रियाँ पर नगरवासी पुरुषों का शोषण सभी प्रकार से होता है। वह ऐसा समझता है कि आदिवासी स्त्रियाँ उसका अपना है, उस पर उसका ही हक है। कितनी ही आदिवासी स्त्रियाँ हैं जो नगरीय पुरुषों के शोषण का शिकार बन गयी हैं; कितनों को अपनी जान देनी पड़ी है और कितनी कौमार लडकियाँ हैं जिन्हें अपनी कौमारावस्था में मातायें बननी पड़ी हैं।

“बिटिया मुर्मू के लिए” ऐसी एक कविता है जो उसके मन के विद्रोह की चिनगरियाँ हैं। पूरी कविता एक आह्वान है या ऐसा कहा जा सकता है कि अपनी जाती की स्त्रियों के लिए एक पाठ है। यह कविता उन निरक्षर, भोली-भाली औरतों को पढाकर उन्हें सचेत बनाने की कोशिश है। कवयित्री उन्हें समझाने की कोशिश करती है कि उनके चारों ओर क्या क्या घटित होती जाती हैं। उन अन्यायों और अनीतियों के अन्धेरे के खिलाफ, सारी साजिशों के खिलाफ बवण्डर जैसा, राख में दबी चिनगारी जैसा उठने को, वह आह्वान देती है।

निर्मला पुतूल की कवितायें ज़िन्दगी की सच्चाई हैं। यह भोगा हुआ यथार्थ है। इन कविताओं के द्वारा वे अपनी जाति की स्त्रियों का पुनरुत्थान चाहती है जिन्हें सभ्य और संस्कृत जनता असभ्य या असंस्कृत कहती है। वे उन्हें इन सभ्य और संस्कृत कही जानेवाली जनता के शोषण से मुक्ति दिलाना चाहती है। दुनिया भर में बुलंद स्त्री शाक्तिकरण के स्वर के साथ अपने स्वर को मिलाकर, कवयित्री ने स्वयं मोर्चा उठाया है। दरअसल, यह अदिवासी स्त्री समाज का एक सफल समाजशास्त्रीय विवेचना है।

Re-entrant Phase Transition in Multi-Component Superconductors

Anand Mohan and V. J. Peter

Department of Physics, St. Paul's College, Kalamassery, Kochi-683 503, India;
anandmohan92@gmail.com and petervadassery@yahoo.com

ABSTRACT

We study Ginzburg-Landau theory extended to a two component order parameter and show the existence of a reentrant superconductive–resistive transition, through specific heat-temperature analysis. This observation is further demonstrated through a field theoretical study of complex scalar field model and show the existence of temperature and bosonic chemical potential induced phase transition. It support the re-entrant superconducting transitions observed experimentally in unconventional multi-component superconductors.

Key words: perturbative, bosonic chemical potential, Ginzburg-Landau

1. Introduction

Conventional and multi-component high T_C superconductors exhibit many electrical transport properties. The phase diagram as a function of temperature reveals a reentrant superconductive-resistive transition associated with the specific character of the tunneling barriers^[1]. Several experimenters have reported a reentrant transition in these superconductors^[2]. Certain models of multi-component superconductors indicate a chemical potential induced mechanism for reentrant phase transition^[3]. These phase transition manifest themselves as sudden jumps or peaks in the specific heat.

In this article, we study Ginzburg-Landau (GL) theory extended to a two component order parameter and show the existence of a reentrant superconductive–resistive transition, through specific heat-temperature analysis. This observation is further demonstrated through a field theoretical study of complex scalar field model and show the existence of temperature and bosonic chemical potential induced phase transition.

The remainder of this article is arranged as follows: first, we show the studies of GL model, while the latter part is devoted for the complex scalar field model.

2. Ginzburg-Landau model

In GL theory superconductivity is described by a complex (or two component) order parameter and the free energy functional as expanded near the T_C is given by^[4]

$$F = \alpha|\psi|^2 + \frac{1}{2}\beta|\psi|^4 + \frac{1}{2}m|(-i\hbar\nabla - eAc)\psi|^2 + \frac{B^2}{8\pi}, \quad (1)$$

where A is the vector potential, which gives a second order phase transition below T_C : $|\psi|^2 = -\alpha/\beta$. In multi-component superconductors there are realignment of flux lines as the phase boundary between two different phases are crossed and this led to the application of London theory in the vicinity of such transitions. Applying this to phase boundaries, the resulting free energy is

$$F = -\alpha|\eta|^2 + \gamma(\eta_+\eta_-^* + \eta_-\eta_+^*) + \frac{1}{2}\beta_1|\eta|^4 + \beta_2|\eta_+|^2|\eta_-|^2 \kappa|D\eta_+|^2|D\eta_-|^2 + \tilde{\kappa}((D_-\eta_+)^*(D_+\eta_-) + c. c.) \quad (2)$$

where $D_j = \nabla_j - \frac{2ie}{\hbar c} A_j$ and $D_{\pm} = D_x \pm iD_y$. Here κ is the Ginzburg-Landau parameter. This free energy is used to derive London free energy for vortex lattice states in a phase with the lowest order non local correction.

$$F = F_0 + \frac{B_0^2}{8\pi} \sum_{q=G} \frac{e^{-q^2\xi^2}}{1 + \lambda^2 \left(\left(\frac{k}{k - \bar{k}} \right) q_x^2 + \left(\frac{k}{k + \bar{k}} \right) q_y^2 \right) + \lambda^4 \frac{\bar{k}^2}{k^2} \frac{(q_x^2 - q_y^2)^2}{\left(\frac{\lambda^2}{\xi^2} + \lambda^2 q^2 \right)}} \tag{3}$$

Here q is to be summed over all reciprocal lattice vectors in the vortex state;

penetration depth $\lambda = \frac{(\beta_1 + \frac{\beta_2}{2}) \hbar^2 c^2}{(\alpha + \gamma) 32\pi e^2 k}$ and Coherence length $\xi = \frac{(2\gamma\beta_1 - \alpha\beta_2)}{(\beta_1 + \frac{\beta_2}{2})k}$.

The second differential of free energy with respect to temperature will give the specific heat C. From eqn. 3, we get the expression for specific heat in the form

$$C = \frac{P(T^2 - T + 2)}{Q} + \frac{PUR}{Q} - \frac{PU}{QS^{-3}} + \frac{PR}{(QS)^3} - \frac{PS^{-4}}{Q} - P(QU)^{-2}S^3 + PQRS^{-3}U^4 - PQ \left(\frac{S^4}{U} - U^{-2}S^{-4} \right) + \frac{P(S^2 + 1)}{QSU^{-2}} + PQRU^2S^{-1} \tag{4}$$

where $P = e^{-T^2 - T}$, $Q = (1-T)^{-2} + (1-T)^{-2}(1+T)^2$,

$$R = \frac{1}{(1-T)^3} + \frac{1}{(1-T)^3(1-T)^{-2}} + \frac{(1-T)^{-2}}{(1+T)^{-2}(T-1)}, S = (1-T) \text{ and } U = (1+T)$$

To understand the behavior of eqn. 2, we follow a numerical approach. In Fig. 1 the variation of specific heat is shown as a function of temperature. This shows a re-entrant behavior; that is, superconducting phase start from a restored phase but again going into a superconducting phase which further restores.

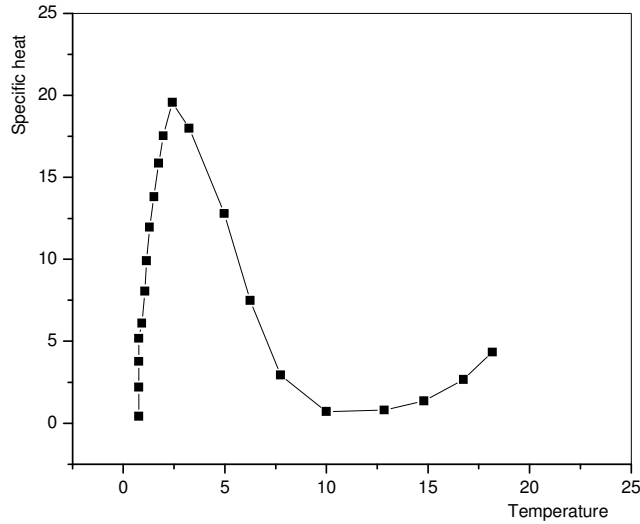


Fig. 1 Variation of specific heat with temperature in the GL theory

3. Complex scalar Φ^4 field

We study the model of a self interacting 2-component spinless field in 3+1 dimensions with an $O(2)$ invariant interaction described by the lagrangian

$$\mathcal{L}(\phi_a(x)) = \frac{1}{2} \partial_\nu \phi_a \partial^\nu \phi_a - \frac{1}{2} m_B^2 \phi_a \phi_a - \frac{\lambda_B}{4!} (\phi_a \phi_a)^2, \quad a = 1, 2. \quad (5)$$

We shall consider a weak coupling case ($0 < \lambda_B < < 1$) and $m^2 < 0$ at finite temperature and density. In the one-loop approximation, effective potential at non-zero temperature and chemical potential is given by

$$V_{eff}^{\beta, \mu} = \frac{1}{2} m^2 \phi^2 + \frac{\lambda}{4} \phi^4 + V_1^{\beta, \mu} \quad (6)$$

where the one-loop term is given by

$$V_1^{\beta, \mu} = -\frac{i}{2} \int_k \ln[(k^2 - M_1^2)(k^2 - M_2^2)] \quad (7)$$

and $M_1^2 = m^2 + \frac{\lambda}{2}\phi^2$ and $M_2^2 = m^2 + \frac{\lambda}{6}\phi^2$.

The integration $\int_k = \frac{i}{2} \sum_n \int \frac{d^3k}{(2\pi)^3}$ with summation over $n = 0, \pm 1, \pm 2, \dots$. This yield^[5]

$$V_1^{\beta,\mu} = \frac{1}{4\pi^2\beta} \int dk. k^2. \ln \left[\sin^2 \left(\frac{\beta i \mu}{2} \right) \cos^2 \left(\frac{\beta i x_1}{2} \right) - \cos^2 \left(\frac{\beta i \mu}{2} \right) \sin^2 \left(\frac{\beta i x_1}{2} \right) \right] \\ + \frac{1}{4\pi^2\beta} \int dk. k^2. \ln \left[\sin^2 \left(\frac{\beta i \mu}{2} \right) \cos^2 \left(\frac{\beta i x_2}{2} \right) - \cos^2 \left(\frac{\beta i \mu}{2} \right) \sin^2 \left(\frac{\beta i x_2}{2} \right) \right] \quad (8)$$

where $x_1^2 = K^2 + M_1^2$ and $x_2^2 = K^2 + M_2^2$. From the effective potential it is possible to calculate the specific heat and is given by

$$C = \frac{-1}{4\pi^2 T^3} \left[\cot \frac{(\mu+X_1)i}{2T} + \cot^2 \frac{(\mu+X_1)i}{2T} + \cot \frac{(\mu+X_2)i}{2T} + \cot^2 \frac{(\mu+X_2)i}{2T} \right]. \quad (9)$$

This expression is studied graphically in Fig. 2 and demonstrates a characteristic similar to that of Fig. 1.

The study of GL theory as well as scalar field model shows the same re-entrant phase transition property. As is known the complex scalar ϕ^4 - model is a covariant version of GL theory of phase transitions in superconductivity. An accurate phenomenological description of the familiar superconducting state is given by these theories. ϕ may be considered as an order parameter or in a microscopic point of view related to wave function. The low temperature with spontaneous symmetry breaking is the superconducting state. As temperature is raised symmetry is restored and superconductivity disappears above the critical temperature T_C . However this is broken again but is further restored with increase of temperature.

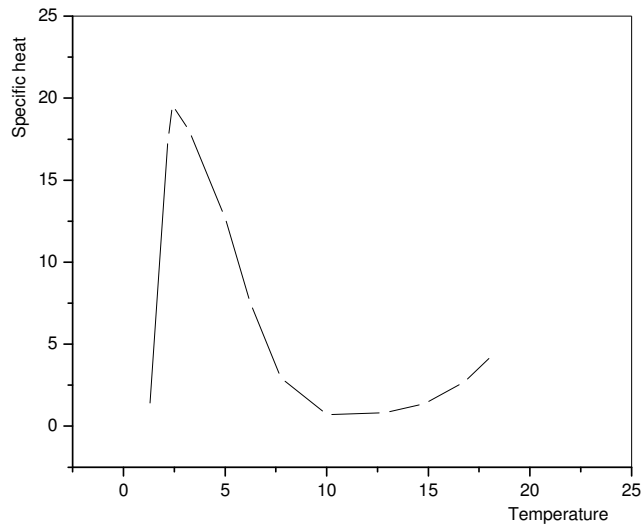


Fig. 2 Variation of specific heat with temperature in the scalar field theory

4. Conclusion

In this study, we analyze Ginzburg-Landau free energy including a doubly degenerate order parameter with its degeneracy broken by a symmetry breaking field, describing superconductivity. Specific heat shows a re-entrant behaviour into superconducting phase starting from a broken phase, with increase of temperature, but is restored with further increase of temperature. This characteristic is further demonstrated with field theoretical calculations in the finite temperature and finite density environment including bosons. A covariant version of the Ginzburg-Landau theory of phase transitions in superconductivity is given by scalar field model. An accurate phenomenological description of the familiar superconducting states is given by these theories. The low temperature with spontaneous symmetry breaking is the superconducting state. As temperature is raised symmetry is restored and superconductivity disappears above the critical temperature. Studies in the finite temperature and finite density

effective potential for the model of a self interacting 2-component spinless field with an $O(2)$ invariant interaction described by ϕ^4 theory with a weak coupling, show a re-entrant phase transition into superconducting phase which is restored at high temperature. This perturbative analysis in the presence of finite bosonic chemical potential making use of high temperature approximations, also show variation of specific heat with chemical potential. The analytical evaluations are further confirmed with numerical computations. These observations support the re-entrant superconducting transitions observed experimentally in unconventional multi-component superconductors.

Reference

- [1] T. Paviopoulos et al, J. Phys. B **91**, 43 (1993),
C. F. Chen, et al, Phys. Rev. Lett. **102**, 227004 (2009).
- [2] H. M. Seyoum, et al, Phys. Lett. A **190**, 483 (1994).
- [3] Hirashima, T. Matsuura, J. Phys. B **165** & **166**, 1051 (1990).
- [4] D. F. Agterberg and Mathew J. W. Dodgson, Phys. Rev. Lett. **89** (2002).
- [5] V. J. Peter and M. Sabir, Mod. Phys. Lett. A**4**, 783 (1991).

Preparation and Characterization of Ce-Si-SBA-15 Modified with Chromium

Rose Philo K. J¹, Eldhose Jacob², Reni George³,
Sugunan S⁴

^{1,2}Department of Chemistry, St. Paul's College, Kalamassery, India.

^{3,4}Department of Applied Chemistry, Cochin University of Science
and Technology, Cochin, India; *marshal_rose@yahoo.com*

ABSTRACT

Solid acids, metal oxides and other mesoporous high surface area support materials are beginning to play significant roles in the greening of fine and speciality chemicals manufacturing processes. Among the variety of catalysts, cerium oxide (CeO₂) play an important role in emerging technologies for environmental and energy-related applications. Transition metals incorporated mesoporous ceria catalysts were prepared by the soft templated method using the neutral surfactant hexadecyl amine (HDA). It is mixed with 5, 10 & 15% SBA-15 prepared by surfactant assisted method. A detailed investigation of physico-chemical characterization of the catalytic systems was performed by techniques such as wide and low angle XRD, BET surface area, pore volume and pore distribution by sorption studies of nitrogen gas, SEM, TG/DTA and FT-IR.

Key words: mesoporous ceria, neutral surfactant, hexadecyl amine, SBA-15

1. Introduction

In every field of human activity, catalysts play vital roles leading to the production of industrial chemicals, fuels, pharmaceuticals as well as environmental pollutant destruction. Catalysis is a complex surface phenomenon

occurring on the surface of a catalyst. Among different catalysts, heterogeneous catalysts are widely used, as they are more environmentally benign. Solid acid catalysts play a crucial role in the petrochemical industry. The increasing demand for new and selective catalysts with larger molecular dimensions led to the discovery of mesoporous catalytic materials. Unlike in the case of microporous and macroporous solids, catalysts with a mesoporous structure can achieve an optimum compromise of high site density and good transport characteristics. Acidic and redox functionalities were generated in these materials by the incorporation of transition metals.

In the field of catalysis, much effort has been spent in the preparation, characterization and application of ceria and ceria based mixed oxide materials. Cerium oxide is an excellent catalyst for redox reactions. In general, the high activity of ceria in redox reactions has been attributed to the ceria reducibility and its high oxygen storage capacity (OSC), and formation of defects, such as oxygen vacancies. Mesoporous SBA-15 material has interesting features like large specific surface area, high porosity, controllable and narrowly distributed pore sizes, good mechanical and thermal stability. But it is amorphous in nature. Its characteristics features make this material very attractive for many applications, such as catalysis, biosensing and controlled drug release. The work is intended to study the effect of mixing mesoporous ceria with different 5 of SBA-15. The outcome of many catalytic reactions can be influenced by the introduction of small amounts of promoter elements. Doping with divalent and trivalent dopants leads to formation of oxygen vacancies, and modification of oxygen mobility and ionic conductivity and catalytic activity. Hence the mixed mesoporous materials are also doped with different % of Cr. The Cr doped compounds oxidize many organic functional groups.

2. Materials and Methods:

2.1. Experimental

2.1.1. synthesis

The materials for the preparation are CeO₂, SBA- 15 and Cr compounds. Chromium nitrate Nonhydrate (Cr(NO₃)₃·9H₂O; Alfa 98.5%), Ce(NO₃)₃·6H₂O (IRE), and ammonia were used as sources for chromium, cerium and alkali respectively. Hexadecyl amine (HDA; Aldrich 98%), was used as surfactant for the synthesis. The CeO₂ can be synthesized by template method by using HDA as the template in ethanol medium followed by calcinations according to the literature procedure[1]. In a typical synthesis procedure, 0.5M aqueous cerium nitrate solution was added with constant stirring to 6 g of HDA in 1:1 ethanol – water mixture (98%, Aldrich) at a precursor to surfactant ratio of 2. The pH was maintained above 10 by adding ammonia solution. After stirring for a predefined time, the precipitate was aged for 3 days at 70°C. Then washed several times with water – ethanol mixture and deionised water. Since the neutral surfactant – inorganic interaction is due to weak hydrogen bonding the removal of most of the surfactant can be done by washing/solvent extraction. The filtered precipitate is dried and then pre-calcined at 250°C for 6 hours to make the calcination effective at lower temperature. The sample is then calcined at 350°C for 4 hrs. To the synthesized CeO₂, SBA- 15 is added in different percentage to get the modified sample of CeO₂ – SBA 15 samples. Mesoporous ceria-SBA-15 mixed samples (Ce-Si-SBA-15) thus obtained were modified with different weight% (2, 4 & 10) of chromium by wet impregnation method.

2.1.2. Characterization

These samples are characterized by various analytical and spectroscopic techniques, viz., powder X-ray diffraction (XRD; Rigaku D MAX III VC), thermo gravimetry-differential thermal analysis (TGDTA; Perkin Elmer TG analyzer), diffuse reflectance ultraviolet-visible (DRUV-Vis; Shimadzu UV-2101

PC spectrometer); FT-IR spectra (Shimadzu FTIR 8201); SEM analysis (*JEOL* JSM-840 A (Oxford make) model16211) and N₂ adsorption–desorption studies (*Micromeritics Tristar 3000* surface area and porosity analyzer).

The X-Ray Diffraction technique is for the identification and characterization of crystalline solid phases in heterogeneous catalysis. It can provide information about specific component in a system, purity of substance, transition to different phases etc. Identification is practically always accompanied by the systematic comparison of the obtained spectrum with a standard one (a pattern), taken from any X-ray powder data file catalogues, published by the American Society for Testing Materials (JCPDS). Structural details of porous materials on a scale covering from approximately 1 to 100 nm maybe determined from measurements of the small angle scattering (SAS) of X-rays.

Surface area determination is an important factor in predicting the catalyst performance. BET method is the widely adopted procedure for the determination of surface area and pore volume. This method is based on the extension of the Langmuir theory to multilayer adsorption. In BET method, adsorption of nitrogen is carried out at liquid nitrogen temperature. In the relative pressure range of $0.02 < p/p_0 < 0.2$ were used in this work. Infrared spectroscopy is a very useful technique for characterization of materials, providing information about the structure of molecules. IR spectrum of a compound is the superposition of absorption bands of specific functional groups.

Thermo gravimetric analysis (TGA) is an analytical technique used to determine thermal stability of a solid and its fraction of volatile components by monitoring the weight change that occurs as the specimen is heated. In TG, the weight loss of a sample is being continuously recorded over a period of time under controlled heating rate. From the thermo gram, where we plot

weight against temperature, information about dehydration, decomposition and various forms or products at various temperatures can be obtained

3. Results and discussions

The fig.1 illustrate the XRD spectrum indexed from JCPDS database of ceria. The typical peaks corresponding to the planes (111), (200), (220) and (311) are observed at $2\theta=28.5, 33.0, 47.5, 56.5(^{\circ})$ respectively. The XRD patterns (Fig.2) of the modified systems show the peaks corresponding to ceria. Cubic fluorite structure of ceria remained intact even after mixing with SBA-15 and then modification with chromium. The characteristic peak of crystalline chromium oxide present in these cases. It is reported that in the case of metal oxides there is a critical value called dispersion capacity, below which the oxide might become highly dispersed on the support without the formation of its crystalline phase. Since characteristic peak corresponding to chromium species is present, it can be concluded that the chromium loading is above the dispersion capacity. Some Cr_2O_3 crystals also formed because of the loading. Table 1 gives XRD data of mixed ceria-SBA-15 modified with Cr samples. Average crystallite size (nm) of ceria decreases from 12.8 to 8.8 by mixing with amorphous ceria. With higher loading, the crystalline size further decreases. Due to the formation of Cr_2O_3 crystal, the crystalline size of sample increases with Chromium addition .Fig.3 shows the low angle XRD pattern of modified sample. The mesoporous nature of the samples is confirmed by the low angle XRD pattern. A Single well resolved peak corresponding to (1 0 0) plane characteristic of 2D hexagonal structure is obtained. The appearance of low-angle diffraction peaks indicates that mesoscopic order is preserved in the calcined metal oxide materials. Small angle XRD pattern of mesoporous SBA-15 displays three well resolved peaks, a very intense peak at $2\theta=0.96$ and two distinct peaks at $2\theta=1.59$ and 1.85 which confirmed that the samples had an ordered structure. The XRD signals were

indexed as (100), (110) and (200), a reflection associated with hexagonal symmetry with space group $p6mm$ which was characteristic of SBA-15 materials. The XRD pattern is similar to those pure siliceous SBA-15 materials as reported by Zhao et al. [2]. The length of the hexagonal unit cell a_0 is calculated from the d spacing values using the formula $a_0 = 2d100/\sqrt{3}$. From IR spectra it was found that, the broad band in the range $3000-3500\text{ cm}^{-1}$ is due to the $\nu(\text{O-H})$ vibrations of H_2O absorbed by the powder sample. Characteristic peak at 1075 cm^{-1} is attributed to the vibrations of Ce-O-Ce bonding. The broad absorption band located in the area from 3200 to 3600 cm^{-1} approximately corresponds to the O-H stretching vibration, and the one located in the area from 400 to 750 cm^{-1} to the CeO_2 stretching vibration. The absorption peaks at 1629 and 1062 cm^{-1} correspond to the H_2O bending vibration and Ce-OH stretching vibration respectively [4]. Morphology as well as structural ordering of mesoporous ceria and SBA-15 samples were analyzed by electron microscopy studies and are shown in figure 4. We have successfully prepared mesoporous ceria, SBA-15 materials, SBA-15 mixed mesoporous ceria and Cr modified mixed samples in well-ordered crystal morphologies through control of synthetic conditions. Morphology depends on the synthesis conditions (silica source; presence of co-surfactant; etc.). Morphologies of prepared materials and its metal-doped families have been well characterized.

SEM analysis of the systems gives us the idea about the surface topography of the catalysts. Fig.4 presents the scanning electron micrographs of metal modified systems. The SEM images clearly show that the morphology of the SBA-15 sample that forms fibrous aggregates, the typical shape of SBA-15 type particles. For sample nano domains of ordered material are observed and worm-like pore channels are dominant. The SEM images of mixed samples resemble that of pure ceria samples. Table -2 gives the surface area and pore volumes of different samples. The mesoporous ceria showed a high (BET)

surface area of $164 \text{ m}^2\text{g}^{-1}$. Mixing of SBA-15 with ceria support increases the surface area, pore volume. This is because; the large surface area of SBA-15 contributes to the surface area of the support. The added SBA-15 molecules are not introduced into the pores of ceria because of its large pore. The surface areas decrease with metal loading. It is due to the large amount of deposited metal oxides. The increasing the percentages of chromium, the surface area and pore volume decreases in a similar manner. This also shows the homogeneous distribution of chromium metal into the surface vacant site attained by wet impregnation method. Figure 5 shows adsorption isotherms of representative samples of ceria mixed with different % of SBA-15 and modified with different % of Cr which resemble Type IV of IUPAC classification with a hysteresis loop which is characteristic of mesoporous solids.[3].This hysteresis loop is due to the capillary condensation, in the mesopores.

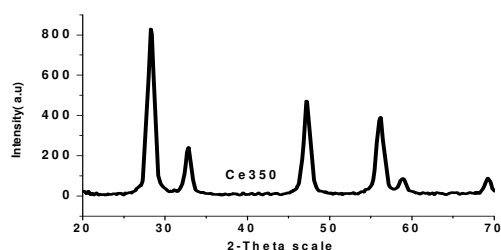


Fig. 1 XRD spectrum of Ce-350

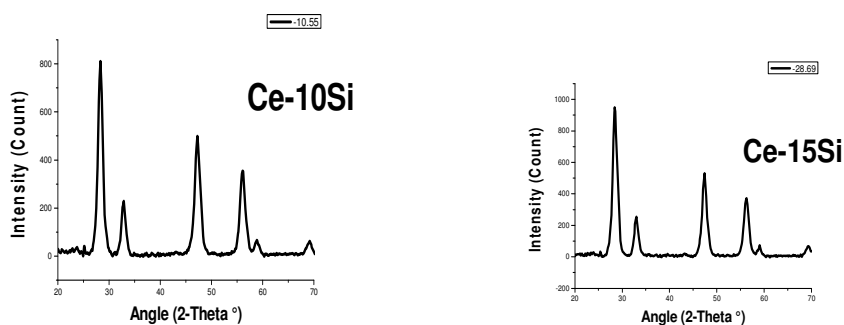


Fig. 2 XRD spectrum of samples of mixed Ce- Si modified with Cr

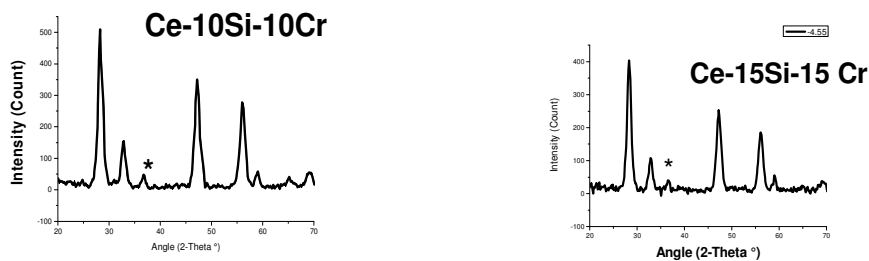


Fig.3 Low angle XRD pattern of modified sample

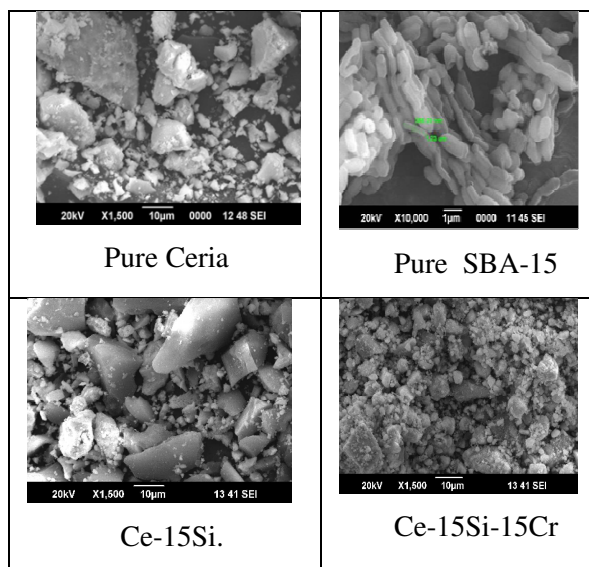


Fig.4 SEM images of some samples

All the samples prepared have ordered pores. As the calcination temperature increases the surface area decreases. Also the surface area and pore volume of the support decrease with the introduction of transition metals. Adsorption isotherms of ceria and modified samples resemble Type IV of IUPAC classification which is characteristic of mesoporous materials. Fig.6 shows the pore size distribution of

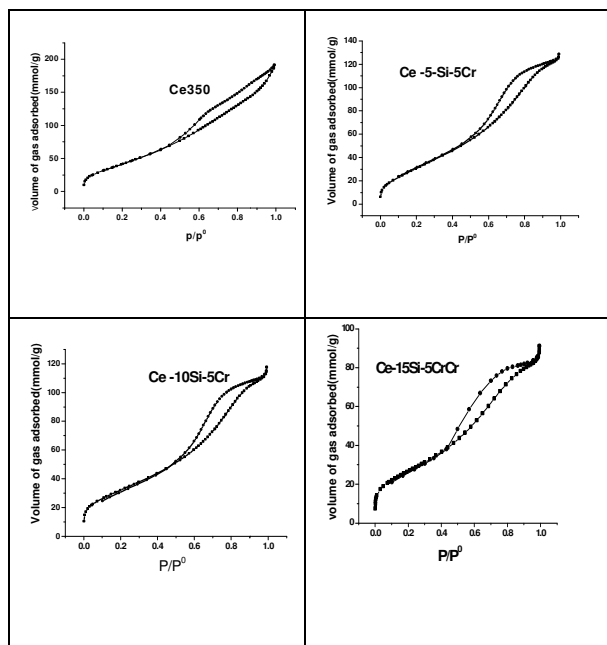


Fig. 5 Adsorption isotherms of Ce-Si-Cr samples

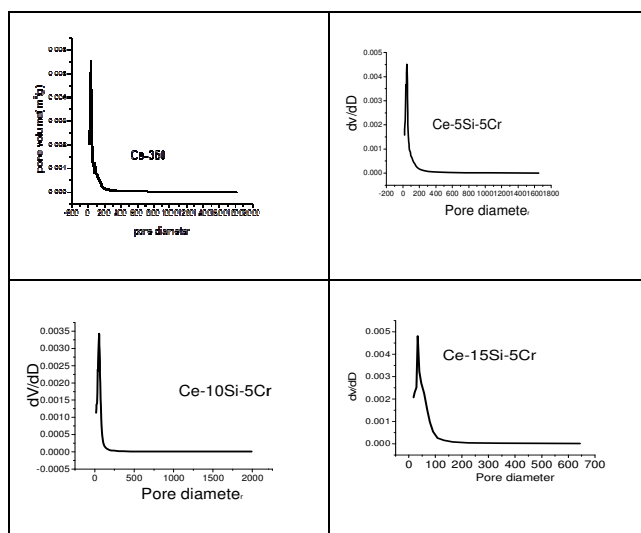


Fig. 6 Pore size distribution of mesoporous ceria containing SBA-15 modified with Cr

Table1. XRD data of mixed ceria-SBA-15 modified with Cr

Sample	Average crystallite size (nm)	Lattice parameter (\AA^0)	d-spacing (nm)
Ce350	12.8	5.45	3.15
SBA-15	-	-	9.10
Ce-10Si	8.8	5.458	3.15
Ce-15Si	8.6	5.42	3.13
Ce-10Si-10Cr	8.79	5.45	3.15
Ce-15Si-10Cr	9.27	5.447	3.149

Table 2. Surface area and pore volume of mesoporous ceria and SBA-15 mixed samples and Cr incorporated systems.

Catalyst	$S_{\text{BET}}(\text{m}^2 \text{g}^{-1})$	Pore volume ($\text{cm}^3 \text{g}^{-1}$)	Pore diameter(nm)
Ce-350	164	0.29	4.6
SBA-15	592	0.84	6.0
Ce-5Si	179	0.34	4.8
Ce-15Si	364	0.51	6.4
Ce-5Si-5Cr	169	0.3	4.2
Ce-10Si-5Cr	179	0.38	4.8
Ce-15Si-5Cr	342	0.41	5.6

different samples. The narrow pore size distribution shows uniformity of the pore. The XRD data of the prepared systems agree well with the standard values for the cubic fluorite structure of ceria. With loading Cr new characteristic phases were observed with the incorporation of transition metal oxides. From FTIR and TG/DTA studies it can be concluded that the neutral surfactant can be successfully removed at a lower calcination temperature attaining maximum surface area.

4. Conclusion

A variety of methodologies for synthesizing mesoporous metal oxides have been investigated. Here in this work mesoporous ceria was prepared by soft templating method using the neutral surfactant hexadecyl amine. The mesoporous ceria thus prepared is mixed with different % of mesoporous SBA-15 prepared by template method using P-123. This SBA-15 mixed ceria is modified with Cr. These catalyst systems are characterized by different characterization techniques. Neutral surfactant route using HDA as surfactant is effective for the preparation of mesoporous ceria with high surface area and pore volume at a lower calcination temperature. Mixing of Ceria with SBA-15 increases the surface area of the support which can increase the activity of the support. Modification with Cr effects the surface area, crystallinity, pore size and can effect the acidity of the sample.

Acknowledgement: The financial support from University Grants Commission (UGC) India to Rose Philo K.J to do Minor Research Project is gratefully acknowledged.

References:

- [1] P. T. Tanev, T. J. Pinnavaia, *Science*, 267, (1995), 865-867.
- [2] Dan-qing Yu, Yue Liu, Zhong-biao Wu, *J Zhejiang Univ- Sci A (Appl. Phys*

Rose Philo K. J, Eldhose Jacob, ...

& *Eng*). in press

[3] Y. Li., Q. Fu, M. Flytzani-Stephalopolous, *Appl.Catal. B.27* (2000) 179

[4] S. Karera, S. Nargis, Patel M. Patel, *J. Sci. Ind. Res.*, 45 (1986) 441.

Mechanical Studies of Nano Kaolin Clay Modified, E-Glass Fibre Reinforced Polystyrene / High Density Poly Ethylene Blends

Tresa Sunitha George^{*^}, Asha Krishnan K[^] and George K. E^{#^}.

^{*}Department of Chemistry, St. Pauls College, Kalamassery, Kochi-683 503

[#]Albertian Institute of Science and Technology, Kalamassery, Kochi-683 503

[^]Department of Polymer Science and Rubber Technology,
Cochin University of Science and Technology, Kochi-682 022, India

sunithariju@gmail.com, kegeorge@cusat.ac.in

ABSTRACT

PS and HDPE are two widely used commodity plastics. In this study amino silane modified nano kaolin clay and glass fiber reinforced PS/HDPE (80/20) composites were prepared by melt mixing and injection molding. Amount of clay was kept constant at 2 wt. % and glass fiber content was varied at 10, 20, 30 wt. %. Mechanical properties such as tensile and flexural properties were found to be improved with incorporation of clay. Characterization has done using Scanning Electron microscopy, (SEM).

Keywords: Glass fibre reinforced composites, nano kaolin clay.

1. Introduction

Polymers are widely used due to their ease of production, light weight and ductile nature. But compared to metals and ceramics, they are inferior in mechanical properties. One way to improve their mechanical properties is to reinforce them with particulate fillers like talc, mica, CaCO₃, kaolin, fumed

silica or fibres like glass fibres, nylon fibres etc.. Nano fillers have now emerged as the ultimate reinforcing agents for polymers for improving their mechanical properties without affecting density, transparency and processability [1–4]. Reinforcing polymers with nano sized clay particles yield materials with enhanced performance without recourse to expensive synthesis procedures [5–7].

Polymer-clay nanocomposites are a class of hybrid materials composed of organic polymer matrix in which layered inorganic particles with nano-scale dimension are distributed with self-assembled pattern uniformly [8]. The development of polymer nanocomposites that contain ultrafine, delaminated or exfoliated phyllosilicates is increasing every day. Minerals of high aspect ratio provide large interfacial area between the mineral particles and polymer chains which result in improvement mechanical properties [9]. These nanocomposites synergistically integrate the advantages of organic polymers with excellent process properties and inorganic materials which have the characteristic like high modulus and strength.

Major challenges in preparing such composites involve the surface modification which requires to obtain a hydrophobic clay surface and subsequently to obtain a homogeneous particle distribution with minimal aggregation. Much of the work in this area however has focused on montmorillonite and silica (10) and relatively few reports are there on other kinds of clay minerals in this application. Now there has been an increased research on organic modified kaolin as a filler in polymer to reinforce the mechanical properties and reduce the cost of polymer products (11).

Glass fibers are the most common of all reinforcing fibers for polymeric matrix composites. The principal advantages of glass fiber are low cost, high tensile strength, high chemical resistance, and excellent insulating properties. Fiber-reinforced polymer composites have seen a rapid rise in use in the past 30

years, due to their high strength and stiffness and light weight, compared with more traditional structural materials, such as steel and aluminum. The reason for this superior performance is the synergistic combination of the two, or more, constituent phases. This synergy is brought about by the interaction between the fibers and the polymeric matrix. Glass fibers (GF) are the reinforcement agent most used in thermoplastic based composites, as they have good balance between properties and costs. However, their final properties are mainly determined by the strength and stability of the polymer-fiber interphase. Fibers do not act as an effective reinforcing material when the adhesion is weak. Also, the adhesion between phases can be easily degraded in aggressive environmental conditions such as high temperatures and/or elevated moisture, and by the stress fields to which the material may be exposed. Many efforts have been done to improve polymer-glass fiber adhesion by compatibility enhancement. The most used techniques include modifications in glass surface, polymer matrix and/or both. However, the results obtained do not show a good costs/properties improvement relationship.

The aim of this work is to study the synergetic effect of low cost nano kaolin clay (at 2%) and glass fiber at different loadings (10, 20, 30%) for the improvement of mechanical and thermal properties of PS/HDPE composites.

2. Experimental.

2.1. Materials.

Polystyrene (General purpose polystyrene) supplied by Supreme Petro Chem Ltd; Mumbai, India; MFI -12gm/10 min (200⁰ C/5 kg).

High density polyethylene: (HD50MA180), Reliance polymers Ltd, Mumbai, MFI-20gm/190⁰C/2.16kg).

Nano kaolin clay-Nano caliber 100 A (Aminosilane) supplied by English India Clays Ltd, India.

Appearance: Off white powder; Plate thickness, (SEM) : < 80nm; Bulk density: 0.2-0.3g/cc; BET Specific surface area: 28-30 m²/g;

Moisture: < 1 w/w%

E glass fibre: E-Glass with grade RP10, Specific Gravity-2.6g/c, Tensile Strength- 3.5GPa, Tensile Modulus-72Gpa supplied by Sharon Industries, Kochi, Kerala

2.2. Nanocomposite fabrication

Blends of PS/HDPE of 80/20 composition containing amino modified kaolinite clay which is kept at fixed ratio of 2 wt. % and E-glass fibre at different loadings of 10%,20%,30% were obtained by a Thermo HAAKE polylab system equipped with roller rotor operating at 180⁰ C; 50 rpm for 8 minutes .The resulting compound were hot pressed into sheets and cut into pieces. The material was then injection molded using a micro injection molding machine with a melt temperature of 190⁰ C and pressure 6 atms.

2.3. Determination of mechanical properties.

Tensile properties were evaluated using Shimadzu Autograph AG-1 series Universal testing machine with a load cell of 10 kN capacity according to ISO 527 on dumb bell shaped specimens.

2.4. Scanning electron Microscopy (SEM).

SEM was used to investigate the morphology of the fractured surfaces. The fractured surface was sputter coated with gold and examined under Scanning Electron Microscope. SEM images were taken using a JOEL model JSM 6390LV

3. Results and discussion.

3.1. Mechanical properties

Tensile Properties

It was observed that tensile strength of the plastic increased depending on fibre content up to 30% glass fibre (GF) and then showed a decrease. As is seen from the tensile strength graph, the tensile strength for the blend with GF was found to be maximum at 30% GF with tensile value of 43 MPa, while it increased to 46 MPa with the addition of 2 wt % of nanokaolin clay. Thus, when blend containing GF was reinforced with 2 wt % of nanokaolin clay 7% increment in the tensile- strengths were observed. When PS/PE material was reinforced with 30 wt% GF and 2 wt. % nano kaolin clay, the tensile strengths increased to 46MPa while the tensile strength of the unreinforced material was found to be 32 MPa. Thus 38% increments were observed when PS/PE was reinforced with 30 wt% fibres, and this increased to 43% with the addition of 2% nanokaolin clay. Thus nano clay acts as a molecular bridge between non-polar matrix and polar fiber and thus enhances the interfacial adhesion between them. A similar trend is obtained in the case of tensile modulus also.

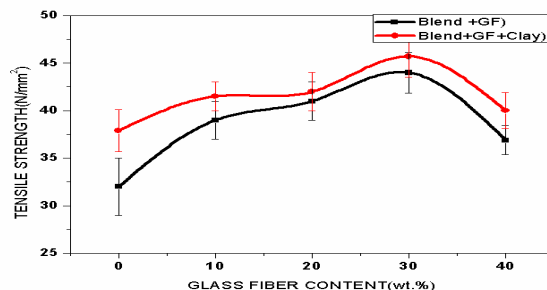


Fig: 1 Variation of tensile strength with filler loading

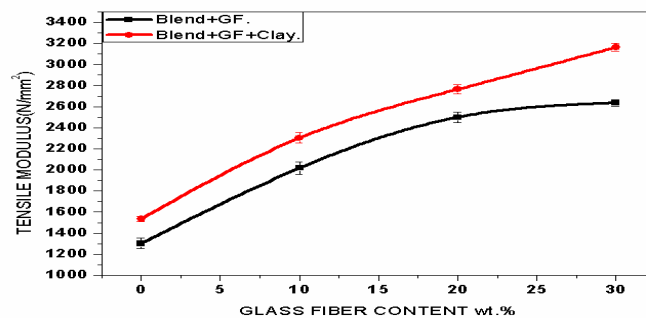


Fig: 2 Variation of tensile modulus with filler loading

An increment of 103% was observed in the tensile modulus value with the addition of 30%GF and modulus increased to 143 % with the addition of 2 wt. % nanokaolinite clay. The reinforcement effect is obvious only with higher content of glass fibers (30% and 40%). The best improvement of interfacial adhesion with amino modified silane was achieved in samples with higher content of glass fibers (30% and 40%).

3.2. Flexural properties

The flexural strength of a material is defined as its ability to resist deformation under load. For materials that deform significantly but do not break, the load at yield, typically measured at 5% deformation/strain of the outer surface, is reported as the flexural strength or flexural yield strength. Flexural strength and flexural modulus of blends with GF at varying compositions of 10, 20, 30, 40 wt. % and blends with GF and nanoclay at 2 wt. % were determined. Flexural strength were found to increase with increase in GF content upto 20 wt.% and then showed a slight decrement, which may be due to overcrowding of GF. While flexural modulus showed a trend of increase in Modulus with increase in GF content. The flexural strength of neat blend was found to be at 45

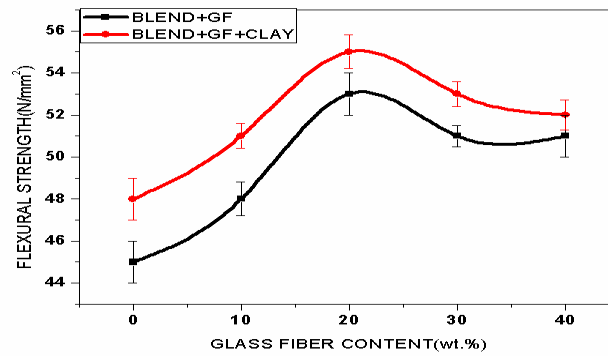


Fig: 3 Variation of Flexural strength with filler loading

MPa and this showed an increment of 53 MPa with the addition of 20 wt. % GF, and further increment of 55MPa with the addition of 2 wt.% nanokaolin clay. Thus 17% and 22 % increment respectively for blend +GF and blend +GF +clay were obtained in the mechanical properties compared to pure blend.175 % increment in flexural modulus was obtained when the neat blend was reinforced.

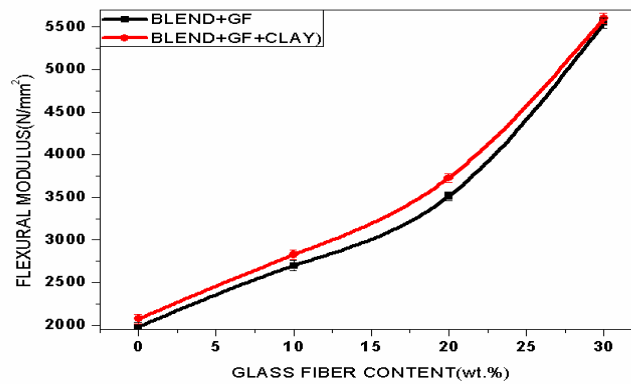


Fig: 4 Variation of flexural modulus with filler loading

3.3. SEM morphology

Since the mechanical properties, of the blends are influenced by the blend morphology as well as interfacial interaction between phases, the consideration of morphologies will be very valuable. The change in mechanical properties is brought by morphology change, as documented in the figures showing SEM micrographs. Figures 5,6,7,8 shows the SEM micrographs of kaolin clay, neat blend, and blend reinforced with GF and blend with GF and nano kaolin clay. After the fragmentation test, the morphology of cryogenically obtained fracture surfaces of micro composites were analyzed by SEM. For the PS/HDPE blend + GF, the neat fiber pullout and the absence of polymer attached to the fibre surface clearly indicate a very limited adhesion between blend and the fibre (Figure 7). On the other hand, the fracture surfaces of blend + GF + Clay

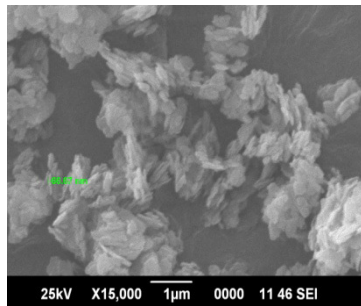


Fig: 6 Nano kaolin clay

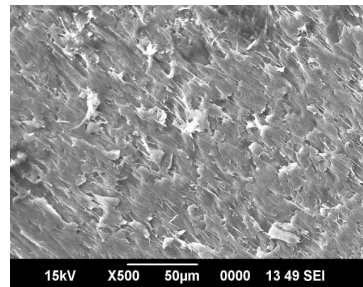


Fig: 7 Neat blend PS/HDPE

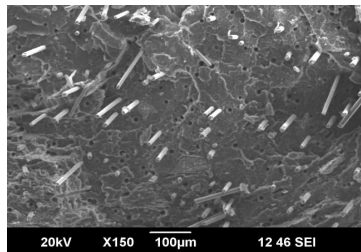


Fig: 8 Blend +GF

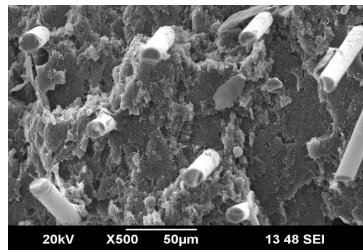


Fig: 9 Blend +Gf+Nano kaolin clay

(Figure 8) features indicating a better fiber-matrix adhesion. SEM studies show that nano clay act as a molecular bridge between non-polar matrix and polar fiber and thus enhance the interfacial adhesion between them. Kaolin clay can be used as a suitable modifier of plastics

Conclusions

Tensile and flexural properties are found to increase in hybrid nano kaolin clay-glass fiber composites. Modulus was enhanced with the incorporation of glass fiber and further increased with an introduction of nanoclay. SEM studies show that nano clay act as a molecular bridge between non-polar matrix and polar fiber and thus enhances the interfacial adhesion between them. Kaolin clay can be used as a suitable modifier of plastics.

Acknowledgements

The authors gratefully acknowledge the support of STIC, CUSAT for SEM analysis.

References:

- [1] Jordan J, Jacob KI, Tennenbaum R, Sharaf MA, Jaisu I, Mater. Sci. Eng. A 393: pp-1–11 (2005)
- [2] Masenelli-Varlet K, Reynaudm E, Vigier G, Varlet, J. ,Polym. Sci. B Polym Phy. 40: pp-272–2835 (2002)
- [3] Vollenberg DHT, Heikens D, Polymer vol:30: pp-1656–1662, (1989).
- [4] Rong MZ, Zhang MQ, Zeng YX, Zeng HM, Friedrich K, Polymer, vol: 42: pp-3301–3304 (2001)

- [5] Vu YT, Mark JE, Pham LH, Engelhardt M, J. Appl. Polym. Sci. 82:1391, (2001).
- [6] Pinnavaia TJ, Beall GW, Polymer-clay nanocomposites. Wiley, New York, Chapter 11 and Chapter 13, (2001)
- [7] Mousa A, Karger Kocsis J, J. Macromol. Matter Eng. pp- 286:260, (2001).
- [8] Liu Xuening, HuNan” Effect of modified kaolin on the crystallization property of PP/ Kaolin nanocomposites”, Science in China Ser.B chemistry, Vol. 48, No.2, pp- 326-333, (2005).
- [9] B.Swoboda, E. Leroy., et al., “Organomodified Ultrafine kaolin for mechanical reinforcement and improved flame retardancy of Recycled Polyethylene Terephthalate”, Royal Society of Chemistry, pp-59-73, (2009).
- [10] Ansari DM, Price GJ, Chromatographic estimation of filler surface energies and correlation with photodegradation of kaolin filled polyethylene. Polymer, No:6 , pp-1823-1831, (2004)
- [11] Ansarifar A, Azhar A, Ibrahim N, Shiah SF, Lawton JMD , The use of a silanized silica filler to reinforce and crosslink natural rubber. International Journal of Adhesion and Adhesives, Vol: 25, No:1 , pp-77-86, (2005)

Preparation, Characterisation and Thermal Studies of Composites of Polyaniline (Doped / Undoped Forms) with Nano Magnetite

Maria Augustine^{1,2*}, Bindu V. U.², P. V. Mohanan²

¹Department of Chemistry, St. Paul's College, Kalamassery, Cochin 683 503, India.

²Department of Applied Chemistry, Cochin University of Science and Technology, Cochin 682 022, India; mariamartinjoe@gmail.com

ABSTRACT

Coating magnetic nanoparticles with conducting polymer has become a promising and important approach to obtain electromagnetic modulated functional nano composites. In the present work nano magnetite is synthesized by co-precipitation method. It is characterized by powder XRD and FT-IR spectroscopy. Polyaniline nanomagnetite composites are prepared by a insitu polymerisation of aniline in the presence of nanomagnetite. Surface modification of the composites are done by doping and by activating it with glutaraldehyde. These nanocomposites were characterized by scanning electron microscopy (SEM), Surface Area Analysis, Thermogravimetric analysis. The formation of nanocomposite is confirmed by FT-IR spectroscopy. The surface morphology from SEM analysis reveals that both polyaniline and nano magnetite blend together uniformly and exhibited excellent magnetic property. Thermogravimetric analysis of the composites suggested that thermal stability increases with nanomagnetite loading.

Key words: Nano Magnetite, Polyaniline, Doped Polyaniline, magnetic composite

1. Introduction

The development of nanometer sized particles has been intensively pursued because of their interesting electrical, optical, magnetic, and chemical properties, which cannot be achieved for their bulk counterparts. Magnetic iron oxide nanoparticles containing magnetite (Fe_3O_4) have been widely studied due to their current and promising applications in catalysis, ferrofluids, magnetic storage, magnetic resonance imaging (MRI), separation, target-drug delivery, clinical diagnosis etc.

Various chemical synthetic routes have been employed to produce magnetite nanoparticles with desired physical and chemical properties, such as co-precipitation of aqueous ferrous (Fe^{2+}) and ferric (Fe^{3+}) salt solution by the addition of a base, micro emulsion technique, hydrothermal synthesis, sonochemical approach, non-aqueous route, and thermal decomposition of an organic iron precursor.

Since their discovery, conducting polymers have received great attention because of their unique properties coupled with potential technological applications. Compared to other conducting polymer polyaniline has been the most extensively studied system due to its electrical and electrochemical properties, good environmental stability, high conductivity in doped form, low monomer cost, ease of polymerization and useful for potential applications in energy storage devices, electron field emitters, chemical and biological sensors, actuators, etc.

More recently multifunctional nanocomposite based on polyaniline and polypyrrole nanostructures, such as nanotubes, nanofibers, nanowires, and nanorods combined with magnetic nanoparticles have also been investigated for applications such as EMI shielding, catalysis, anti-biofouling, immunity assay,

separation and purification of biomolecules, carriers for targeted drug delivery, biosensors and electromagnetic device applications have been reported

Among the various magnetic dispersions, magnetite nanoparticles are useful because of their low toxicity, high saturation magnetization. The preparation of stable magnetite nanoparticles is a challenge as the nanoparticles possess high surface area to volume ratios and tend to aggregate to reduce their surface energy. In addition, the strong magnetic dipole–dipole interaction and Vander Waal’s attractive forces among the nanoparticles also cause the particles to aggregate. One of the important strategies to overcome the above limitations is to shield the magnetite nanoparticles by coating them with macrocyclic surfactants, polymers, inorganic metals, or oxides. The surrounding layer around each particle not only avoids further aggregation but also provides a useful platform for more functionalization.

A number of articles have been published on the magnetic and conducting polymeric nanocomposite of polyaniline composites containing nanoparticles such as $\text{BaFe}_{12}\text{O}_{19}$, Al_2O_3 and Fe_3O_4 , etc. Various synthetic methods have been reported, which include direct precipitation of iron salt in a solution of polymer, oxidative chemical polymerization, the in situ synthesis of polymer via an oxidative or electrochemical procedure in presence of well-dispersed magnetic nanoparticles etc. Magnetite Polyaniline nanocomposite were also prepared by other means such as modification-redoping method, high energy ball milling method, precipitation–oxidation technique, and chemical oxidative copolymerization of aniline and 5-amino-2-naphthalenesulfonic acid in presence of magnetite nanoparticles.

2. Experimental

2.1 Materials

Iron (II) sulphate heptahydrate, Iron (III) chloride hexahydrate, Ammonium Hydroxide (25%), Aniline (S.D. Fine – chem. Ltd. Mumbai), Ammonium persulphate (S.D. Fine– chem. Ltd. Mumbai), 0.2 M HCl (prepared from Conc. Hydrochloric acid GR, Merck), Glutaraldehyde

2.2 Preparation of nano – magnetite particles

Nano - Magnetite particles (Fe_3O_4) were prepared by co-precipitating ferric and ferrous salts in an alkaline solution followed by washing in hot water dissolve 27.8 g of iron (II) sulphate heptahydrate ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$) and 54 g iron (III) chloride hexahydrate ($\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$) in 100 mL double distilled water. Mix the above thoroughly. Add drop wise NH_4OH to the above solution, constant stirring at room temperature until the pH becomes 9. Heat the obtained precipitate at 88°C for 30 minutes. Black particle were obtained that exhibiting strong magnetic response. Wash the particle with copious amount if hot distilled water. Magnetite is dried in vacuum oven at 70°C for two days. It is finely grinded and sieved.

2.3 Preparation of Magnetic Composite

2.3.1 Preparation of Emeraldine salt- magnetite composite (ES)

Distilled aniline (1.82 mL, 0.2 M) was dissolved in 0.2 M hydrochloric acid in a volumetric flask to 100 mL of solution. Ammonium peroxydisulfate (5.7131 g, 0.25 M) was dissolved in 0.2 M hydrochloric acid to 100 mL as well. Both the solutions were kept for 1 hour in an ice bath. 5g of fine-graded pre-sintered Fe_3O_4 powder is added to the aniline solution with vigorous stirring in order to keep Fe_3O_4 powder suspended in the solution. To this reaction mixture, ammonium persulphate, which acts as an oxidant, is added slowly drop wise with continuous vigorous stirring during a period of 10 minutes. After the addition, the reaction mixture is stirred for 2 hours. The temperature is maintained below 5°C

throughout the reaction. Then it is left at rest at 5⁰C overnight to polymerize. Next day, decant the solution using a magnet at the bottom of the beaker to remove the liquid and non coated polymer. Wash the precipitate with 0.2M HCl solution until the filtrate become colorless to remove the residual monomer, the oxidant and its decomposition products. The treatment with HCl provides more uniform protonation of ES. It was washed with distilled water and then 300 ml acetone to remove the low molecular weight organic intermediates and oligomers. It also prevents the aggregation of ES during drying, so that product was obtained as fine powder. The resulting protonated emeraldine magnetite was dried at room temperature for 3 hour and further in an oven at 70⁰C for 3 hour.

2.3.2 Preparation of emeraldine base magnetite composite (EB)

The emeraldine base–magnetite composite was prepared by deprotonation of emeraldine salt magnetite composite. For that Emeraldine salt composite was stirred with 100 ml 25% ammonia solution for 1 hour. It was then filtered, and dried under suction for 10 minutes. The precipitate was then washed with 1l (100 ml per portion) distilled water. It is then dried under suction for 30 minutes and then dried under vacuum at 60⁰C for 48 hours.

2.4 Activation of Polymers with glutaraldehyde

1 g each of the dried polymers was mixed with 2.5 % (v/v) glutaraldehyde solution prepared in 0.1 mol L⁻¹ potassium phosphate buffer on pH 6. The mixture was allowed to react under reflux for 2 hour. All supports were washed with the same buffer to free of excess glutaraldehyde and dried.

3. Result

3.1 Physio—Chemical Characterization of Magnetite

3.1.1 Powder XRD

The crystalline structures of sample were determined by powder XRD patterns (Fig. 1). The diffraction patterns and relative intensities of all diffraction peaks match well with those from the JCPDS card (19-0629) for pure magnetite. No other iron oxide or hydroxide phase was observed.

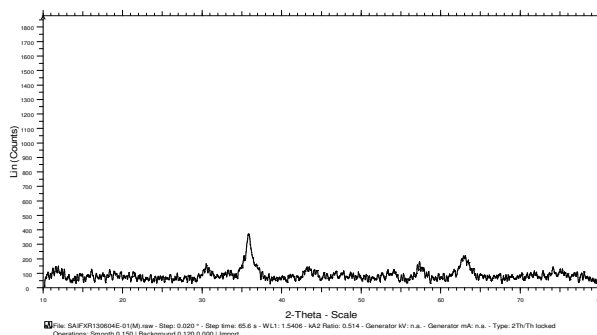


Fig.1 XRD Pattern of Nano-Magnetite

The broad peaks suggest the nanocrystallite nature of the magnetite particles. The diffraction peak of scattering angle (2θ) of 30.478° , 35.868° , 43.452° , 54.187° , 57.376° , 63.154° matches with corresponding to the reflection from 220, 311, 400, 422, 511 and 440 crystal plane with cubic phase spinel structure. In the case of Fe_3O_4 , a peak at $2\theta = 35.829$ ($d = 2.50424$) is observed at higher intensity. X-ray peaks of maghemite were not observed, which indicate the absence of maghemite structure in it.

Particle size of Fe_3O_4 is determined using Debye-Scherrer equation. The peak corresponding to the maximum intensity, $2\theta = 35.829$, $d = 2.50424 \text{ \AA}$ is used for particle size calculation. Magnetite of nano particle size of Fe_3O_4 is 18 nm. There are two distinct classes of super paramagnetic nano particle depending upon particle size, super paramagnetic iron oxide nanoparticles (spion) with mean particle diameter of more than that of 50 nm and ultra small super paramagnetic iron oxide nanoparticles (uspion) with a mean particle diameter of

less than 50 nm. From the particle size of Fe_3O_4 , clear that they are under the category of uspion

3.1.2 FT-IR Spectroscopy

The FT-IR spectra of nano magnetite in KBr matrix is shown in the Fig.2

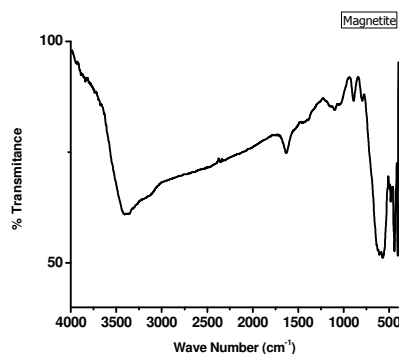


Fig. 2 FT-IR spectrum of Magnetite

The broad characteristic band from 3500 to 3100 cm^{-1} could be assigned to O-H stretching vibration in physically adsorbed hydrogen bonded water molecule. In addition, the absorption band at 1623 and 2351 cm^{-1} on the spectrum can also be correlated to the different modes of bonded water molecules existing the iron oxide lattice. The prominent peak at 570 and 602 cm^{-1} , are attributed to the stretching and torsional vibration modes of the Fe-O bonds in tetrahedral and octahedral sites respectively. The sharp and high intense peak appears on the range 790 - 890 cm^{-1} demonstrates the high degree of crystallinity of Fe_3O_4 . The characteristic absorption bands therefore confirm the presence of spinel structure. The result is consistent with reported result.

3.2 Physiochemical Characterization of Magnetic Polyaniline Composites

From the various physiochemical characterization techniques we get an idea about the structural changes on magnetite after coating with polyaniline.

Nano sized particle has a large surface area when compared to that the commercial metal oxides and thus an enhanced absorption capacity than that of commercial metal oxide.

3.2.1 FT – IR Spectroscopy

The FT-IR spectra of nano magnetite composite of polyaniline in KBr matrix is shown in Fig. 3. The aniline polymers have the general formula $[(-B-NH-B-NH)_Y(B-N=Q=N-)_X]_n$ in which B and Q denote the phenyl rings in the benzoid and quinoid form, respectively. IR spectroscopy is one of the useful methods for

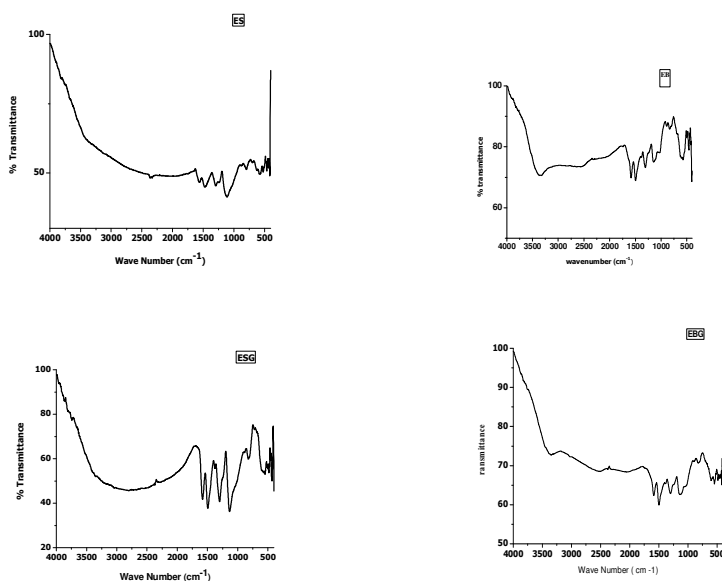


Fig. 3 FT-IR spectra of polyaniline – magnetite nanocomposites

determining functional groups present in a compound, and for polyaniline, it is most useful for obtaining qualitative information regarding the average oxidation state.

The 1600-1450 cm^{-1} is the aromatic ring breathing, the main peaks in this region are at 1580 cm^{-1} and at 1471 cm^{-1} due to the stretching deformation of C=C in quinoid (Q) ring and benzoid (B) ring respectively. Therefore, it demonstrates that the aromatic structure of PAN is retained in the composites ES, ESG, EB, and EBG.

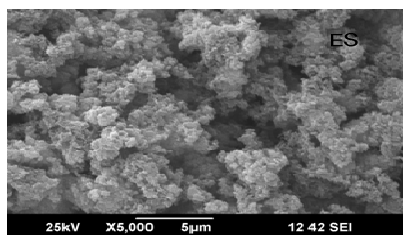
An intensity ratio of the peak at 1587 cm^{-1} to that at 1471 cm^{-1} is a quantitative measurement of the oxidation state of PAN. The analysis of infra-red spectra shows that quinoid to benzoid intensity ratio was varied for all the samples, showing indication of some structural modification during the formation of these composites. The intensity of quinoid band is less than the benzoid band, which shows presence of more reduced units in the polymer chain.

A broad peak around 3500 – 3000 cm^{-1} in the polyaniline magnetic composite corresponds to the NH stretching vibration. A weak absorption around 3100 – 2800 cm^{-1} is the C – H stretching vibration. The absorption bands below 1000 cm^{-1} in the polyaniline composite clearly shows the presence of magnetite, as it arises from the interatomic vibrations of Fe-O lattice in the magnetite. The peak around 3500 cm^{-1} viewed in the spectrum of magnetite is masked by the intense peak of PAN in that region. Also certain peaks are shifted in vibrational frequency were also observed on comparison with pure PAN and magnetite spectrum. These changes confirm the formation of these PAN – Magnetite nano composite.

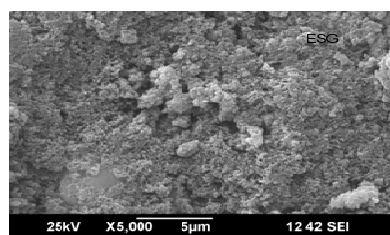
The coating of PAN to the surface of the magnetic particles takes place through the hydrogen bonding between N-H groups in the PAN and OH group of bonded water molecules in the ferrofluid, resulting in the encapsulation of magnetic particles by PAN. The FT-IR spectrum confirms the bonding of PAN strongly to the surface hydroxyl groups on Fe_3O_4 nanoparticles.

3.2.2. Scanning Electron Microscopy (SEM)

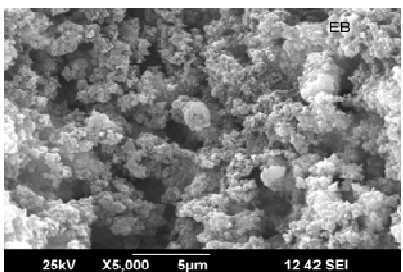
Typical SEM micrographs of polyaniline – magnetite composites clearly present different morphologies with respect to the size and shape of the particles of the prepared samples. The SEM images of pure magnetite, and polyaniline from the reported literature is compared with that of the composite. The surface of the Fe_3O_4 NPs is smooth. The pure polymers, shows particulate structure with a fairly uniform size distribution and is observed to be relatively loosely packed.



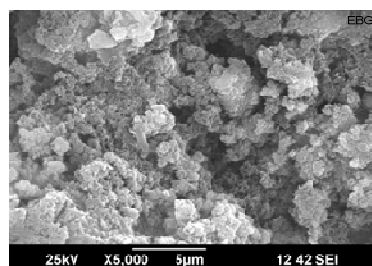
ES



ESG



EB



EBG

Fig. 4 The SEM micrograph displaying surface morphology of polyaniline composites

The surface of the magnetite nanocomposite become rougher due to the polymerization occurred on the surface of magnetite nanoparticles. In contrast, a more spherical morphology of polymer as clusters is clearly observed on surface

of the polymer-magnetite composite compared with pure polymer. It indicates that nano-sized inorganic particles possess a nearly spherical morphology and influence strongly the composite morphology. It is observed from the micrograph that some oxide particles are covered by spherical nature of polymer which form multiparticle aggregates, presumably because of weak interparticle interactions. The Fe_3O_4 NPs are observed to dissolve in the 1.0 mol L^{-1} hydrochloric acid solution and the color changes to yellow. However, the magnetite polymer nanocomposite does not dissolve in the same acid solution, which indicates that magnetite nanoparticles have been successfully protected by the polymer matrix.

3.2.3. Surface Area Analysis

BET surface area of the polymers is given below. The highest surface area is shown by the polyaniline acid – magnetite nano composite. It is evident that glutaraldehyde activation reduces the surface area.

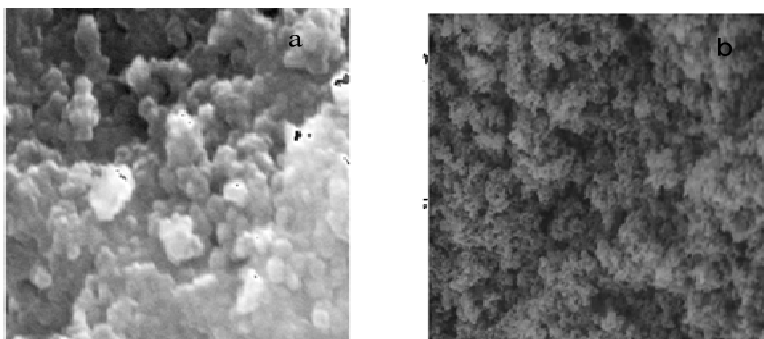


Fig. 5 SEM images a) Magnetite b) Polyaniline

3.2.4. Thermogravimetric Analysis

The Thermogravimetric curves of the prepared magnetic nanocomposite of ES, ESG, EB, EBG, under nitrogen atmosphere are shown in the figure.

Table 1. BET surface area of polymer –magnetite nanocomposites

Polymer	Surface Area (m ² /g)
ES	39.4696 ± 0.2386
ESG	36.0927 ± 0.0838
EB	34.3193 ± 0.0335
EBG	33.3837 ± 01671

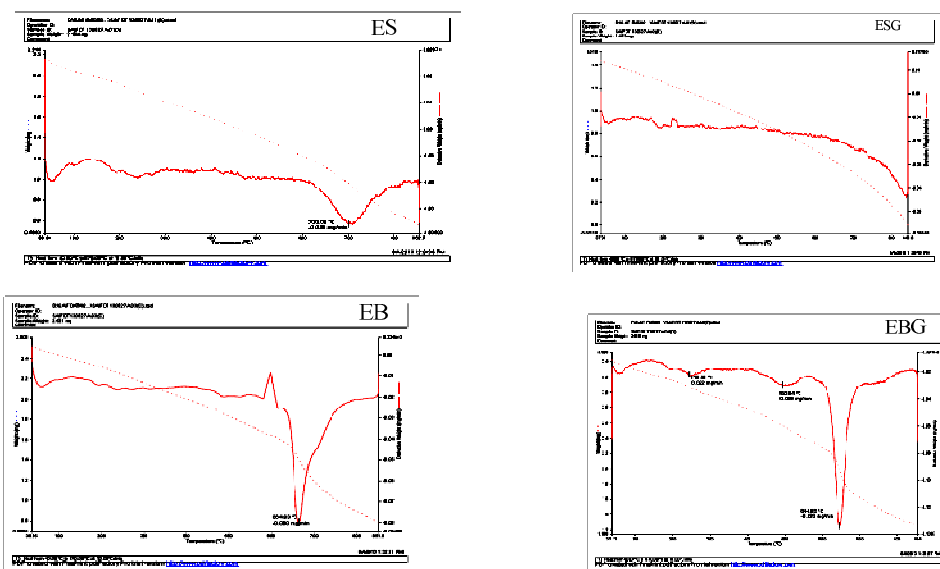


Fig. 6 TG of polyaniline composites

Figure 6 depicts the thermo gravimetric curves for polyaniline –magnetite nanocomposite under nitrogen atmosphere studied at a heating rate 10 °C/min in the temperature range of 40–840 °C. The thermogram of ES shows a typical three step weight loss behavior. The first weight loss starts from room temperature to 180 °C corresponds mainly to water and a small proportion of gaseous HCl originating from slight deprotonation process. The second weight

loss occurs between 200 and 320 °C corresponds to the most of the HCl together with water molecule which are more strongly bonded to the polymer chain. A final step starting at 600 °C is due to a large scale thermal degradation of the PAN chains, whereas in the case of pure polyaniline, it was reported to occur at 450 -500 °C. The enhanced thermal stability of composites as compared to pure PAN may be due to the interaction between PAN and Fe₃O₄ NPs, which restricts the thermal motion of PAN chain in the composite. It is clear from the TG curve that ESG exhibited more thermal stability than ES.

In the case of undoped polyaniline composites EB and EBG, two step weight loss behavior – first one around 100 °C corresponds to the loss of water molecules bound to the polymer and the second weight loss starts at 620 °C corresponds to the degradation of the polymer backbone.

4. Conclusion

Nano sized Magnetite was successfully prepared. It is characterized by FT-IR spectroscopy and PXRD technique. The Size of the magnetite particle was obtained by using the Debye-Scherrer equation. The magnetite particle size was 18nm. It exhibited prominent magnetic properties.

Magnetite nanocomposites of polyaniline were synthesized. The formation of nanocomposite is confirmed by FT-IR, Surface Area Analyzer, SEM, and Thermogravimetry Analysis. It is also activated with Glutaraldehyde. Four different Nanocomposite of polyaniline were ES, ESG, EB, and EBG.

Nanocomposite are thermally-stable than the pure polymer with thermal stability to temperatures in excess of 420 °C. The activation with GA did not affect the thermal stability of these polymers. Surface area analysis showed that treatment with GA reduces the surface area of the composite.

Acknowledgments

The authors gratefully acknowledge the guidance of Dr. P.V. Mohanan, Assistant Professor, Department of Applied Chemistry, Cusat the facilities provided by the Department of Applied Chemistry, Cusat. the financial support provided by Council for Scientific and Industrial Research (CSIR).

References:

- [1] Arico, A. S., Bruce, P.; Schalkwijk, W. V., Scrosati, B.; Tarascon, J. M. *Nat. Mater.* **2005**, *4*, 366.
- [2] Ashoori, R. C. *Nature.* **1996**, *379*, 413.
- [3] Bein, T., Wu, C. G., *Science* **1994**, *264*, 1757.
- [4] Bennett, L. H., McMichael, R., Shull, R. D., Swartzendruber, L., Watson, R. E. *J Magn Magn Mater.* **1998**, *111*, 29.
- [5] Berge, A., *et al* , JT. *Progress Polym Sci.* **1992**, *17*, 87.
- [6] Bhatnagar, S., Rosensweig, R. E. *J. Magn Magn Mater.* **1995**, *149*, 198.
- [7] Billas, I. M. L., Chatelain, A., de Heer, W. A. *Science* **1994**, *265*, 1682.
- [8] Casciari, R. , Moskowitz, B., Raj, K . *J Magn Magn Mate.* **1995**, *149*, 174.
- [9] Hu, A. G., Lin, W. B. Yee, G. T. *J. Am. Chem. Soc.* **2005**, *127*, 12486.
- [10] Moskowitz, R., Raj, K. *J. Magn. Magn. Mater.* **1990**, *85*, 233.
- [11] Wan, M., Wei Y, Zang, L. *Macromol Rapid Commun.* **2006**, *27*, 366.
- [12] Wang, C.W., Wang, Z. *Chem Phys Lett.* **2001**, *341*, 431.

Effect of itaconic acid grafting on the mechanical properties of Polypropylene / Polystyrene / dialkyl silane modified kaolin clay

Asha Krishnan. K¹, Tresa Sunitha George^{1,*}, K.E.George^{1,#}

¹Department of Polymer Science and Rubber Technology, Cochin University of Science and Technology, Kochi- 682022, India.

*Department of Chemistry, St. Paul's College, Kalamassery-683503.

Albertian Institute of Science and Technology, Archbishop Angel Mary Nagar, Kochi-682 022, India; *principal@aisat.ac.in*

ABSTRACT

Itaconic acid compatibilized Polypropylene / Polystyrene / dialkyl silane modified kaolin clay nanocomposites were prepared by melt blending technique. The effect of dialkyl silane modified kaolin clay (N100Z) and compatibilizer on the static and dynamic mechanical properties on of nanocomposites was investigated. The prepared nanocomposites were characterized using DMA. The dynamic mechanical analysis reveals higher storage moduli over a temperature range of 40–125°C for nanocomposites. Mechanical properties of compatibilized nanocomposites are found to be higher than that of uncompatibilized nanocomposites.

Keywords: Itaconic Acid, Kaolin Clay, DMA

1. Introduction

Polymer / clay nanocomposites (PCNs) have attracted significant academic and industrial interest in recent years. The nano-sized-layer-filled polymers can exhibit dramatic improvements in mechanical and thermal properties at low clay contents because of the strong synergistic effects between the polymer and the

clay on both the molecular or nanometric scale [1]. Nanocomposites based on Polypropylene/Polystyrene (PP/PS) blend have been studied extensively by many researchers [2-4]. Because of the strong hydrophilic nature of the clays, adhesion between clays and non-polar polymers is low and the dispersibility of clay layers in polymer matrix is limited. In order to increase the dispersibility of nanoclays within the polymer matrices grafted polymers are used as compatibilizers.

In this part of study Itaconic acid (IA) is used as a compatibilizer for PP/PS blend. In this study IA is added directly into nanocomposites and the hydroxyl group of clay reacts with IA and disperses the nanoclay well within polymer matrix through in situ compatibilization. The compatibilizer was prepared by grafting reaction of IA onto PP/PS blend in the presence of Dicumyl peroxide (DCP) initiator. The aim of this study is to determine the effect of the [Polypropylene/Polystyrene]-g-itaconic acid ([PP/PS]-g-IA) as a compatibilizer in the mechanical properties of PP/PS clay nanocomposite.

2. Methodology

a. Materials: - Polypropylene homopolymer (REPOL H200MA) with a melt flow index of 25g/10 min (230⁰C/2.16Kg) was purchased from Reliance Industries limited, Mumbai, India. General purpose Polystyrene (MFI (200⁰C/5Kg) is 12g/10 min) was obtained from Supreme Petrochem Ltd India. The dialkyl silane modified clay (Nanocaliber 100Z - N100Z) had a bulk density of 0.2-0.3g/cc and a BET specific surface area of 28-30 m²/g. Itaconic acid pure AR with molecular weight of 130.10, melting range of 165-167 ° C was supplied by Spectrochem Pvt. Ltd. India.

b. Preparation of the Compatibilizer: - The compatibilizer was prepared by grafting reaction between IA and PP/PS blend in the presence of a DCP initiator at 170°C for 8 min. The reaction was conducted by melt mixing in a Thermo Haake Polylab system equipped with roller rotors. PP and PS were allowed to

melt for 2 min initially. A constant amount of DCP (0.5wt %) along with IA (3 wt %) is added into the melt.

C. Preparation of nanocomposite

PP/PS (80/20) blends were mixed with modified kaolin clays and the compatibilizer using a Thermo HAAKE PolyLab system equipped with roller rotor operating at 180 °C and 50 rpm for 8 min. The resulting compounds were hot pressed into sheets and cut into pieces. The material was then injection molded at 190 °C.

Dynamic mechanical analysis (DMA Q-800, TA instruments) was used to study the effect of nanoclay on the viscoelastic properties of nanocomposites. Rectangular shaped specimens of dimension 35mm ×4mm ×3 mm were used. DMA tests were conducted at 5 frequencies (0.1, 1, 3,5,10 Hz). A temperature ramp was run from 38 to 125 °C at 3 °C/min.

Tensile properties of nanocomposites were evaluated using Shimadzu Autograph AG-I series universal testing machine at a crosshead speed of 50 mm/min and according to ASTM D 638. The injection molded dumbbell shape specimens had 115 mm, a width in the gauge section of 5 mm and a thickness of 3.2 mm. A minimum of five samples were tested in each nanocomposite and the average results were recorded.

Flexural strength of nanocomposites was measured by three point loading system using UTM (Shimadzu AG-1) with a load cell capacity according to ASTM D 790. The testing was done at a crosshead speed of 5 mm/min. Rectangular bars of dimensions 60 X12.7 X 3.2 mm³ (width ×length × thickness). A minimum of five samples were tested in each nanocomposite and the average results were recorded.

The Izod impact strength of the injection molded samples was determined as per ASTM D 256. The test was carried out using REIL IMPACTOR JUNIOR (CEAST) machine with a pendulum of 4kJ and striking velocity of 3.4m/s.

3. Results and Discussion

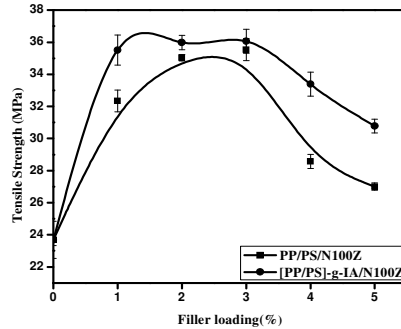


Fig. 1 Variation of tensile strength with filler loading

Figure 1 and 2 shows the variation of tensile strength and tensile modulus of uncompatibilized and compatibilized clay nanocomposites with filler loadings. The tensile strength and moduli of the nanocomposites are increased by

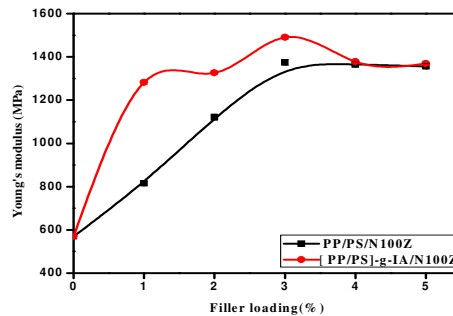


Fig. 2 Variation of tensile modulus with filler loading

the addition of itaconic acid as a compatibilizer. This improvement is due to better stress transfer and increased interfacial interaction. The improvement in mechanical properties is due to better dispersion of clay particles when [PP/PS]-g-IA is used as the compatibilizer. Thus the addition of [PP/PS]-g-IA increased the interaction between nanoclay–polymer and thus significantly increased the stiffness of the PP/PS/clay nanocomposites.

Figures 3 and 4 gives the effect of IA on the flexural strength and flexural modulus of PP/ PS clay nanocomposites. The degree of dispersion of clay particles is improved by the addition of itaconic acid and results in better stress transfer due to improved interfacial adhesion. The improvement in flexural properties is due to the high stiffness and aspect ratio of silicate layers [5].

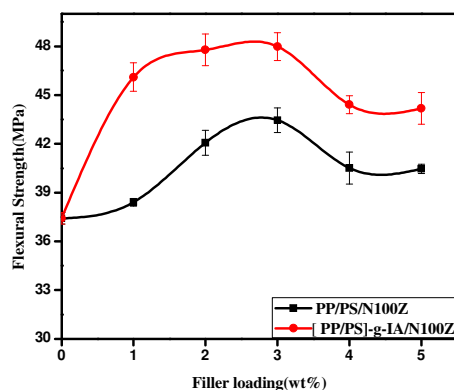


Fig. 3 Variation of flexural strength with filler loading

From the Figure 4 it is seen that the incorporation of Itaconic acid leads to an increase in impact strength of PP/PS blend than the corresponding nanocomposites. The enhanced impact strength may be attributed to the improved interfacial adhesion between PP/PS due to the presence of compatibilizer and modified clay.

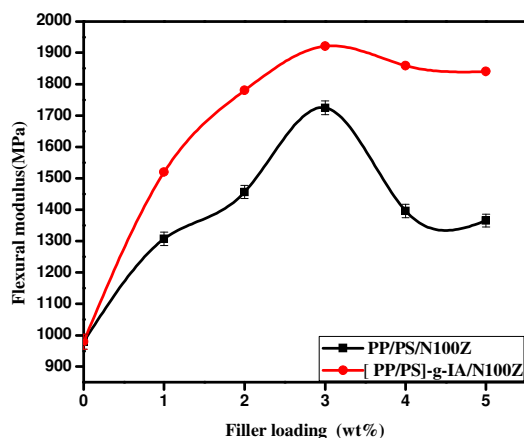


Fig. 4 Variation of flexural modulus with filler loading

This substantial improvement shows the ability of [PP/PS]-g-IA to act as an impact modifier and compatibilizer. The presence of organoclay platelets, especially in the compatibilized systems allows deforming to larger strain before crack propagation takes place [6]. After reaching a maximum the impact strength shows a reverse trend. However at higher clay loadings the embrittlement and weak resistance of crack propagation plays a major role. Shanti V. Nair *et al* studied the fracture initiation and fracture propagation toughening of polyamide 6, 6 (PA-66) polymers with different types of layered silicate clay having nanoscale (fully dispersed) or multiscale (mixed nanoscale/microscale) structure. According to Nair, the reduction in toughness of polyamide 6, 6/clay nanocomposites is due to the formation of micro cracks in the crack-tip region in the vicinity of reinforcement– matrix interfaces, which enhance the local stress fields in the crack-tip region and tend to reduce toughness [7]. Thus it is of interest to note that the nanocomposites containing grafted polymers show higher toughness without a reduction in strength and stiffness.

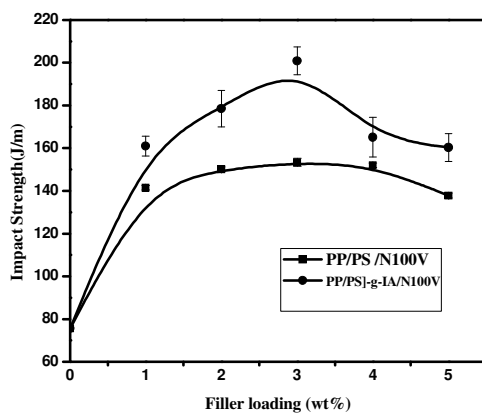


Fig. 5 Variation of impact strength with filler loading

The dynamic mechanical properties of IA compatibilized clay nanocomposites at 3 wt% are studied over a wide temperature range from 40 to 125°C and the results are shown in Table 1. Figure 5 shows the storage modulus curve for compatibilized clay nanocomposites. The storage modulus of compatibilized nanocomposites is higher than that of uncompatibilized clay nanocomposites.

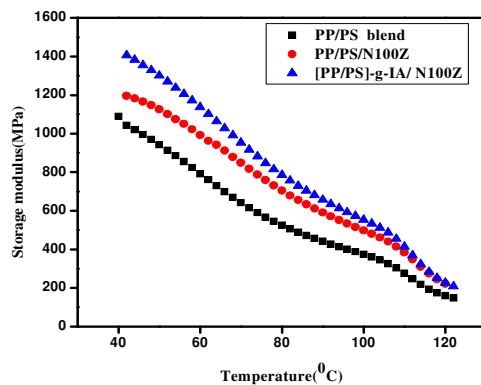


Fig. 6 Storage modulus curves of PP/PS blend, PP/PS/N100Z and [PP/PS]- g-IA/N100Z nanocomposites

Table 1 Results obtained from DMA curves of PP/PS blend, PP/PS/N100Z and [PP/PS]-g-IA/N100Z nanocomposites

Samples	Storage modulus (MPa)				Tg(°C) from tan δ value
	45 ⁰ C	80 ⁰ C	100 ⁰ C	120 ⁰ C	
PP/PS blend	1007	525	374	159	114.95
PP/PS/ N100 Z	1175	709	503	217	113.46
[PP/PS]-g-N100Z	1369	785	552	227	115.58

The increase in storage modulus is due to the better dispersion of clay particles within the polymer matrix after the addition of compatibilizer. The presence of itaconic acid as compatibilizer increases the interaction between clay layers and IA group through hydrogen bonding and this will increase the dispersion of clay particles within the polymer matrix and increase the stress transfer [8, 9].

it is apparent from the table 1 that the presence of clay and compatibilizers does not influence the T_g value.

4. Conclusion

The compatibilized nanocomposites show improved mechanical properties compared to uncompatibilized clay nanocomposites and this is due to the improved interfacial adhesion between PP and PS in presence of compatibilizer and modified clays. The storage modulus of compatibilized blends is greater than the modulus of neat matrix. The presence of clay and compatibilizers does not influence the T_g value from the tan δ curve.

References:

- [1] Yu-Qing Zhang, Joong-Hee Lee, Han-Jong Jang, Chang-Woon Nah, Composites: Part B, vol: 35, pp- 133–138 (2004).
- [2] Maria Pilar Villanueva, Luis Cabedo, Jose Maria Lagaron, Enrique Gimenez, Journal of Applied Polymer Science, Vol: 115, pp-1325–1335 (2010).
- [3] Yan Zhu, Yuzhen Xu, Lifang Tong, Zhongbin Xu, Zhengping Fang , Journal of Applied Polymer Science, Vol: 110, pp-3130–3139.
- [4] Oana M. Istrate, Micheal A. Gunning, Clement L. Higginbotham, Biqiong Chen, Journal of Polymer Science Part B: Polymer Physics Vol: 50, pp- 431–441 (2012).
- [5] Kusmono, Z. A. Mohd Ishak, W. S. Chow, T. Takeichi, Rochmadi, Express Polymer Letters, Vol: 2, No: 9, pp- 655–664 (2009).
- [6] Waraporn Rattanawijan, Taweechai Amornsakchai, Pornsawan Amornsakchai, Pinsupha Petiraksakul, Journal of Applied Polymer Science, Vol: 113, pp- 1887–1897 (2009).
- [7] Shanti V. Nair, Lloyd A. Goettler, Bruce A. Lysek, Polymer Engineering and Science, Vol: 42, No: 9, (2002).
- [8] Yeh Wang, Feng-B. Chen, Yann-C. Lib, Kai-C. Wu, Composites: Part B, 35, pp- 111–124 (2004).
- [9] Sangeeta Hambir, Neelima Bulakh and J. P. Jog 'Polymer Engineering & Science, Vol: 42, No:9), pp-1800–1807 (2002).

Discernible growth of Gold Loan NBFCs in India

Justine George¹ and Alphonsa Kurian²

¹Department of Economics, St. Paul's College, Kalamassery, Kochi-683503, India.

²Department of Sociology, B.C.M College, Kottayam.

jusgeorge@gmail.com, alphonsakunthara@gmail.com

ABSTRACT

Discernible growth of gold loan NBFCs recorded mainly on the backdrop of appreciation in gold price affirming the indicators of financial soundness such as capital adequacy ratio, Non Performing Asset (NPA) and share of borrowing in the total asset of bank that are contained well within the limit specified by RBI. However, the sharp correction of gold price would have a devastating effect not just on gold loan NBFCs but also on the entire financial market.

Keywords: NPA, RBI, NBFCs

1. Introduction

Over the years, gold loan NBFCs witnessed an upsurge in Indian financial market, owing mainly to the recent period of appreciation in gold price and consequent increase in the demand for gold loan by all sections of society, especially the poor and middle class to make the both ends meet. Though there are many NBFCs offering gold loans in India, about 95 per cent of the gold loan business is handled by three Kerala based companies, viz., Muthoot Finance, Mannapuram Finance and Muthoot Fin Corporation. Growth of gold loan NBFCs eventuating from various factors including Asset Under Management (AUM), number of branches, and also the number of customers, in the less developed financial market in India raises many concerns such as: did the growth of these

companies accelerate from the absence of a well-functioning financial market? Or, how far the policies of RBI were able to keep up the financial standard of these companies? Or, are they financially sustainable? Or, do they pose any threat to the financial system because of their exposure to bank credit? These issues ought to get immediate elucidation and must be settled by appropriate policy interventions. This paper tries to examine some of the above mentioned issues in detail and attempt to arrive in a consensus on each of these issues. The paper is structured into five sections encompassing the introduction and conclusion. While the second section discusses a brief overview of gold loan NBFCs, growth and performances are discussed in the third section. The fourth section discusses the correlation between the NBFCs and the current financial system.

2. Overview of Gold loan NBFCs in India

Gold is an idle asset in the hands of individuals and there is a huge unlocked economic value in the Indian economy, which is said to have anywhere between 18000 to 20000 tonnes of gold. Yet, only three per cent of this idle gold stock is being used for raising gold loans. But, gold loan NBFCs came to public attention when Manappuram Finance Limited hit the capital market in November 2010 with a Qualified Institutional Placement (QIP) for Rs. 1,000 Crores, followed by Muthoot Finance Limited's Initial Public Offer in April, 2011 of around Rs. 900 Crores. Later, Muthoot Finance Limited as well as Manappuram Finance Limited also came up with a Non Convertible Debentures (NCDs) of significant amount. Growth of NBFCs occurred both in terms of the size of their balance sheet and their physical presence that compelled to increase their dependence on public funds including bank finance and non-convertible debentures. Aggressive structuring of gold loans resulting from the uncomplicated, undemanding and fast process of documentation along with the

higher Loan to Value (LTV) ratio include some of the major factors that augment the growth of Gold loan NBFCs. Upsurge and widespread establishment of these companies invited regulatory headwinds from March 2012 and since then, many rules and regulations were imposed on this sector with a view to contain their growth. Fixation of Loan To Value¹ ratio is the main norm employed by the RBI that imposed a slashed LTV of 60 percent as compared to the earlier level of 80 percent, for loans granted against the collateral of gold on 21st march 2012. Growth of NBFCs started to saturate since then and RBI raised LTV up to 75 per cent on 3rd January 2014.

3. Growth and Performance of Gold loan NBFCs in India

The ascending price of gold, the quantum of black money in the market, the general price level, the rate of return on alternate financial assets, the lack of easy availability of alternative financial products, the easy availability and highly liquid nature of gold, the prevalence of specific socio-cultural system, are some of the major driving factors triggering gold demand that has led to the huge accumulation of gold in India. Both organized and unorganized gold loan businesses have been growing along with the accumulation of gold, however, the recent period of appreciation in gold price has mainly led to the growth of organized loan businesses. Since the market share of gold loans NBFCs dominated by Muthoot and Manappuram LTD. Therefore, average profit of Gold Loan NBFCs in the figure1 is the average of profit after tax of Muthoot Finance LTD and Manappuram Finance LTD. Figure 1, showing the co-movement of gold price and profit growth of Gold loan NBFCs clearly indicates that the growth of profit started in 2005 concomitant with the appreciation of gold, lasts up to the end of 2013. Looking back, the sustained increase in gold prices had two positive strokes for the gold loan business. On the one hand, it kept scaling the eligible loan amount per gram of gold which made gold loans a compelling

proposition for the customers, and on the other hand, it kept defaults in check because of ver, it is likely that the business will eventually stabilize to a period of steady growth. At this juncture, it is necessary to ascertain the growth and level of sustainability of the gold loan NBFCs by evaluating their financial performance and their sources and uses of funds. Moreover, on account of their striking growth, it is necessary that their activities may be closely monitored through regular and more frequent collection of relevant financial data, analysis and monitoring. More frequent on-site and off-site supervision is also asked for.

Implementation of RBI guidelines will necessarily restrict the competitive positions of gold loan NBFCs vis-à-vis those of banks and the unorganized sector. In such a situation, while borrowers with limited stocks of jewellery may move to the unorganized sector that will continue to offer loans at higher LTV ratios, the interest-sensitive borrowers on the other side will shift to

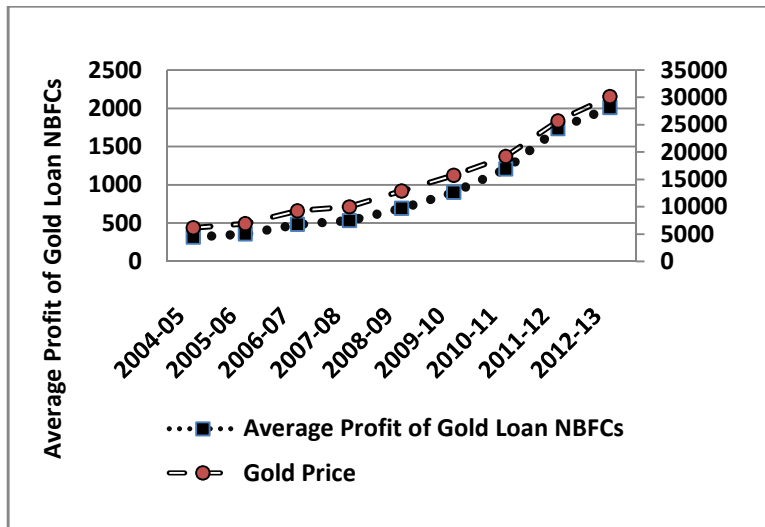


Fig. 1 Average Profit of Gold Loan NBFCs and Gold Price

Source: Calculated using RBI data base and various anual reports of Muthoot Finance LTD, Manappuram Finance LTD

Nationalized banks that offer loans at much lower costs for similar or higher LTV ratios.

4. Interconnectedness of NBFCs in the financial system

Gold loan NBFCs' interconnectedness with the formal financial system increased in proportion in the recent years as gold is also preferably held indirectly by leveraged institutions like banks and non-banks as collateral in their loans. However, a sizeable portion of their borrowings come from the banking system. Since, the primary business of these NBFCs is lending against gold, any drastic fall in the gold market leading to a sharp correction in the gold price will potentially have a disturbing effect on the banking system. An analysis of the sources of funds of gold loan NBFCs revealed that their dependence on the banking sector witnessed an increase during the last five years. The consistent increase in the dependence of the gold loan NBFCs on the banking sector seriously raises sincere concern. There is a need for the NBFCs to reduce their over-dependence on any one source and necessarily develop a balanced system of financial sourcing, while strengthening their capital funds as a risk buffer. Inter-linkage between banks and gold loan NBFCs could potentially create the possibility of systemic risk in the financial sector, if unchecked. It may be pointed out that banks do face 'concentration risk' on account of their gold loan activities, since the business of gold loans NBFCs are associated with absolute concentration in one commodity. This risk may reduce in future as the gold loans NBFCs are now trying to maximize their profit by diversifying into loans backed by land and other securities.

However, indicators of financial soundness such as capital adequacy ratio, Non-Performing assets, are contained well within the limit (RBI 2013: 14 &16). Conversely, loans given to gold loan NBFCs by banks at present form only a negligible portion of the banks' total assets and may not have significant

implications for the stability of the financial system. And hence, any stress in gold loan portfolio may not have serious repercussions on the stability of the banking sector as a whole. Even if we accounted for the loans given by banks to gold loan NBFCs, the total exposure of banks to gold loans still worked to be less than 3 per cent of total bank credit by end March 2012 (RBI 2013: 172, 173). The indicator of financial soundness, namely, leverage of gold loan NBFCs appears to be a cause of concern. In addition, there is a need for improving the owned funds of NBFCs. Higher level of capital is required for (a) raising their owned sources of funds and consequently, reducing their reliance on borrowed funds and their leverage. (b) Though the present levels of NPAs for gold loan companies are low and the probability of any drop in gold prices also seems to be low, higher capital can be a general cushion for these companies against unforeseen losses, if any, on their balance sheets.

There are also interlinkages within the gold loan NBFC segment in the form of gold loan NBFCs floating unincorporated sister concerns to undertake financial activities, which are not permitted by the regulator. Such activities primarily involve raising public deposits and diverting these funds towards the registered gold loan NBFC. Raising public deposits by such illegitimate means can have implications for public confidence in the concerned NBFCs and non-banking financial sector as a whole.

5. Conclusion

Gold loan NBFCs cater the needy sections of the society, especially the poor and the middle class to keep up their social and economic life, as they otherwise are not eligible to get credit from the banking sector. Discernible growth of gold loan NBFCs recorded mainly on the backdrop of appreciation in gold price affirming the indicators of financial soundness such as capital adequacy ratio, Non Performing Asset (NPA) and share of borrowing in the total asset of bank

that are contained well within the limit specified by RBI. Rules and regulations on gold loan NBFCs and concomitant decline in gold price have led to the saturation of growth of NBFCs. In short, the sharp correction of gold price would have a devastating effect not just on gold loan NBFCs but also on the entire financial market.

End note: The loan-to-value (LTV) ratio is a financial term used to express the ratio of a loan to the value of gold pledged

Reference

- [1] RBI (2013): 'Report of the Working Group to Study the Issues Related to Gold Imports and Gold Loans NBFCs in India' .
- [2] Reddy, Y.V. (1996): "Gold in the Indian Economic System", Address at the gold Economic Conference organised by the World Gold Council at New Delhi on November 28.
- [3] Reddy, Y.V. (1997): "Gold Banking in India", Address at the World Gold Council Conference held in New Delhi on August 2.
- [4] Jagirdar, Brinda and Sumit Jain (2012): "Gold Consumption and its Impact on Indian Economy", Mumbai.
- [5] Various Audited Annual Financial reports of Muthoot Finance LTD and Manappuram Finance LTD.

