

Name of Scholar: Bharathi.N.P.

Name of Supervisor: Dr. Athar Adil Hashmi

Name of Department: Chemistry, JMI

Title of Thesis: **Synthesis and Characterization of Metal Containing Polymers,
Screening for Antimicrobial Activity and Control Release Study**

INTRODUCTION

Metal incorporated polymers which are versatile for their scientific and industrial importance have emerged with wide applications such as aqueous thickeners, impregnates, textile seizers, additives, resins, catalysts and in the biomedical fields . Organotin containing materials are the most widely used organometallic that have surprisingly diverse applications like stabilizers, catalysts, industrial and agricultural biocides, antifouling and wood processing agents. Drugs have been incorporated into polymers whereby the biological activity of organotin moieties is coupled with the biologically active drug.

The thesis is divided into six chapters as follows:

Chapter 1. INTRODUCTION AND LITERATURE REVIEW

This chapter deals with the development and progress of polymer science along with its importance in modern technologies. This includes general introduction, literature review on metal containing polymers and their applications. Organometallic polymers, mainly organotin polymers, the controlled release technology used in antifouling paints, metal containing drugs and the applications of antimicrobial polymers are incorporated.

Chapter 2. Synthesis, Characterization and Biological Studies of Organotin Polymers

This chapter briefly explains the antimicrobial properties of some newly prepared oil based organotin polymers by the condensation reaction between fatty amide diol (N, N¹- bis-2-hydroxy ethyl castor oil fatty amide) obtained from castor oil and organotin dihydroxide. The structural studies of these polymers were carried out by FTIR, ¹HNMR and ¹³CNMR spectroscopic techniques. Standard laboratory methods were used to study the physiochemical characteristics. The thermal stability was analyzed by TGA and DSC. All three polymers are fairly active against the tested bacterial species.

Chapter 3 Preparation and Characterization of Antifouling Tin based Polymer

The antimicrobial activity of a newly prepared vegetable oil based organotin polymer by the condensation reaction between fatty amide diol and butyltin chloride dihydroxide against the bacterial species and fungal strains is given in this chapter. The conventional spectroscopic techniques such as FTIR, ¹HNMR and ¹³CNMR have been used

to establish the structure of the polymer. The physicochemical characteristics like acid value, hydroxyl value, saponification value, iodine value, specific gravity and viscosity were determined by standard laboratory methods. In addition, the thermal stability was analysed by TGA and DSC. The polymer is fairly active against the tested microbial species and showed antifouling property. These observations may serve as a guide for studying the control release of this polymer and could be a promising future in the field of antifouling paints, pesticides and long lasting wood protective

Chapter 4. Antimicrobial Activity and Control Release Study of Newly Synthesized Tin containing materials

The control release study of some newly prepared oil-based organotin polymers by the condensation reaction between fatty amide diol obtained from linseed oil, adipic acid and organotin dihydroxide is briefly explained in this chapter. The structural studies of these polymers were carried out by FTIR, $^1\text{H-NMR}$ and $^{13}\text{C-NMR}$ spectroscopic technique. MIC of the polymers was determined against different fungal and bacterial species. *In vitro* antifungal (anticandidial) and antibacterial activity of the polymers were also studied. The growth curve (turbidometric measurement) was also checked for one of the fungal species

Chapter 5. Synthesis, Characterization and Antimicrobial Studies of Zinc containing Polymers

This chapter explains the synthesis, characterization and antimicrobial studies of Zinc containing edible oil (coconut oil) based polyesteramide resins prepared by the condensation polymerization between N, N¹-bis-2-hydroxy- ethyl coconut oil fatty amide, $\text{Zn}(\text{OH})_2$ and citric acid / tartaric acid . The structural studies were carried out by FTIR, $^1\text{H-NMR}$ and $^{13}\text{C-NMR}$ spectroscopic techniques. Standard laboratory methods were used to study the physicochemical characteristics. Both polymers were examined for antifungal, antibacterial properties and compared with a standard drug. The growth curve was studied using a conventional spectrophotometer for the tartaric polymer against *C.albicans*.

Chapter 6. Physicochemical Studies and Antimicrobial Screening of Novel Oil-Zinc Polymers

The physicochemical studies and antimicrobial screening of novel Zinc containing oil based polyesteramide resins synthesized by condensation polymerization reaction between castor/ soyabean oil derived castor / soyabean fatty amide diol (HECA/ HESA), $\text{Zn}(\text{OH})_2$ and adipic acid is given in this chapter. Spectroscopic techniques such as FTIR, $^1\text{HNMR}$, $^{13}\text{CNMR}$ have been used to establish the structure of the polymers. *In vitro* antifungal activity and antibacterial activity were also examined. Growth curve studies were carried out with the polymer SZ against *E. coli*.