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Synthesis characterization and biodegradability studies of coordination polymers

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ABSTRACT

The thesis deals with the synthesis of biodegradable coordination polymer which utilizes the biodegradable nature of starch, properties of inorganic metal ions and the characterstics of organic molecule possessing donar atoms such as O, S, N etc. The spectroscopic analysis (FTIR, NMR) confirm the structures of the polymers. Magnetic moment and electronic spectral studies were used to explain the geometry of central metal ions in the polymeric chain. TGA (thermogravimetrical analysis) explained the thermal stability of the polymer and their polymer metal complexes. The incorporation of metal ion in the polymeric backbone enhances the thermal properties as well as reduced biodegradability.

All the needs of modern society, e. g., food, fuel, energy, and materials, are highly dependent on diminishing fossil resources. Therefore, governments, industry, and academia are inputting much effort towards finding a sustainable solution for the increasing energy crisis. All these issues are providing a strong initiative towards the development of technologies to produce biobased and biodegradable plastics. Biopolymers have been used to develop new structures for biomedical applications such as tissue engineering, organ regeneration and for controlled drug delivery systems in the pharmaceutical industry. Biopolymers adsorbents are efficient and can be used for the decontamination of effluents,for separation processes and also for analytical purposes.

The thesis has been divided into the following seven chapters.

Chapter 1: Coordination polymer ,historical background and its applications

The present chapter discusses about the properties and applications of coordination polymers, sustainable or non sustainable resource based polymer metal complexes as well as general applications in different biomedical fields and non medicinal fields.

Chapter 2: Material instruments and techniques involved

This chapter describes the various instruments analytical tools and techniques used to characterize the material synthesized.

Chapter 3: Synthesis characterization and biodegradable studies of starch urea/thiourea ligand and their polymer metal complexes

This chapter deals with the preparation of SUr, STU ligand and SUr/STU-M(II) complexes, where M(II) is Mn(II), Co(II), Ni(II) Cu(II) and Zn(II) using a starch polymer ,urea , thiourea and transition metals. The different characterization confirm the enhanced thermal stability and reduced biodegradability in comparison of polymeric ligand and their polymer metal complexes.

Chapter 4: Synthesis characterization and biodegradable studies of starch phenol/salicyldehyde ligand and their polymer metal complexes

This chapter deals with the preparation of SPhe, Ssald ligand and SPhe/Ssald-M(II) complexes, where M(II) is Mn(II), Co(II), Ni(II) Cu(II) and Zn(II) using a starch polymer, phenol, salicyldehyde and transition metals. The different characterization confirms the enhanced thermal stability and reduced biodegradability in comparison of polymeric ligand and their polymer metal complexes.

Chapter 5: Synthesis characterization and biodegradable studies of starch Semicarbazide/ Thiosemicarbazide ligand and their polymer metal complexes

This chapter deals with the preparation of SSemi, STsemi ligand and SSemi/STsemi-M(II) complexes, where M(II) is Mn(II), Co(II), Ni(II) Cu(II) and Zn(II) using a starch polymer, semicarbazide, thiosemicarbazide and transition metals. The different characterization confirm the enhanced thermal stability and reduced biodegradability in comparison of polymeric ligand and their polymer metal complexes.

Chapter 6: Synthesis characterization and biodegradable studies of starch Glutaraldehyde/ Lysine ligand and their polymer metal complexes

This chapter deals with the preparation of SGlu, SLys ligand and SGlu/SLys-M(II) complexes, where M(II) is Mn(II), Co(II), Ni(II) Cu(II) and Zn(II) using a starch polymer, glutaraldehyde, lysine and transition metals. The different characterization confirm the enhanced thermal stability and reduced biodegradability in comparison of polymeric ligand and their polymer metal complexes.

Chapter 7: Conclusion and future prospects

This chapter deals with the conclusion of the synthesized material, the output obtained and the measures taken by consideration of the synthesized product and the concern of the ecology due to usage of conventional material in use.