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Title of the Thesis: **Silver Polymeric Nanocomposites: Synthesis, Characterization, and Their Mechanism**

Abstract

Introduction: These underlying themes are nanocomposites, surfactant, polymers and extract of different plants. Morphology, composition and optical properties of these nanocomposites were studies. On the basis of kinetic data, nuclei formation as well as the influence of reaction species on nuclei morphology, mechanism to the formation of advanced silver-nanocomposites will be discussed. Agglomeration number (NAg), the average number of silver atoms per nanocomposite (N), molar concentrations of nanocomposite (C) in solution, extinction coefficient (ε) and increase in the Fermi energy were calculated by using Mie theory and also discussed.

Chapter second: Is concerned with experimental work, kind of materials and instruments used for characterization of nanomaterials.

Chapter three: Contains the preparation and kinetic of silver-nanocomposites (AgNCs) by using the extract of *Allium sativum* as a reducing agent. Sulfur containing biomolecules of extract, especially, Cysteine is responsible to the reduction of Ag^+ ions into metallic Ag0. The synthesized silver-nanocomposites show an intense surface plasmon resonance band (SPR) at 410 nm. Sun light effect, digital and TEM (transmission electron microscope) images with size distribution histogram of the AgNCs formation were recorded in presence and absence of sun light. Thus the reaction follows first-order kinetics with respect to $[Ag^+]$.

Chapter four: We used an aqueous leaves extract of *Camellia sinensis* to synthesize AgNCs. The choice of Camellia sinensis as reducing agent is based on its rich content of

polyphenolic compounds particularly epigallatocatechin-3-gallate (EGCG). The anisotropic growth of AgNCs was confirmed by the appearance of characteristic SPR band at ca. 440 nm. Apparent first-order rate constants were calculated. TEM and SAED (selected area electron diffraction) of AgNCs was also recorded in absence and presence of shape-directing cetyltrimethylammonium bromide (CTAB).

Chapter five: This chapter contributes first experimental evidence to the shape-directing role of [Ag^+] and [CTAB] in the synthesis of AgNCs using lemon juice at room temperature. Choice of *Citrus lemon* for reducing aqueous silver salt is due to the presence of citric acid. In UV-vis spectra a well defined SPR sharp band appeared at ca. 475 nm. TEM and SAED results indicate the mixed kind of morphology of AgNCs. The apparent rate constants, k_{obs}, values were determined from the slopes of the initial tangents to the plots of ln (a/(1-a)) versus time.

Chapter six: Reported the synthesis of AgNCs by using *Dioscorea deltoidea* (*D. Deltoidea*) tuber aqueous extract as a reductant. The choice of *D. deltoidea* as reducing agent is based on its rich content of steroid sapogenin known as Diosgenin. The Ag-composites show an intense surface Plasmon resonance (SPR) band at 425 nm. TEM image and SAED were also recorded to confirm the formation of AgNCs.

Iodometric titration was used to confirm the encapsulation of AgNCs inside the helical structure of amylose, water soluble constituent of starch for first time. TEM images taken for Iodometric titration were also explain the reversible encapsulation nature of AgCPs. On the other hand UV-visible absorption spectrum was also recorded for each Iodometric titration. The stoichiometry of the complexation between the KI-I_2 and starch (deep blue color) present on the surface of AgCPs was calculated.