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Title : **Inorganic Nanofillers Immobilised Chitosan Based Membranes for Biomedical Applications**

Abstract

The recent advancements in the field of nanotechnology extend their applications in biomedical field of sciences. The thesis presents the fabrication of chitosan based membranes with different inorganic nanofillers immobilized to them which further investigated for different biological activities.

Chapter 1 provides a comprehensive and systematic literature review on chitosan, their source of extraction, significant physical and chemical properties, inorganic nanofillers, which include different nanoparticles and their various applications with especial emphasis on biomedical.

Chapter 2 deals with the green synthesis of silver nanoparticles by using peels of three citrus fruits as waste material of fruit. The spherical, well dispersed nanoparticles exhibits high zone of inhibition against gram positive and gram negative bacterial strains with potent antioxidant activity. Besides, cell cycle arrest at G1 phase reveals the anticancer activity against lung cancer cell line and therefore open an avenue for their utilization biomedical research field.

Chapter 3 evaluates the efficacy of silver nanoparticles synthesized from *P. granatum* peel extract. DLS, TEM and XRD shows the spherical shape, size and distribution of nanoparticles revealing remarkable radical scavenging and anticancer activity due to the intracellular ROS generation which cause apoptosis in cancerous cell while the normal human peripheral blood mononucleated cells remain viable and it proves their biomedical potential.

Chapter 4 investigates the successful immobilization of spherical shaped crystalline silver nanoparticles inside the chitosan matrix with different concentrations. The physicochemical studies reveals the incorporation of silver nanoparticles inside the polymeric matrix by contact angle measurements, TGA, XRD and SEM analysis. The nanocomposite shows good

anticancer, antimicrobial as well as antioxidant activity against DPPH and NO free radical with good total reducing capability concluding their efficacy to be used in biomedical field of sciences.

Chapter 5 evaluates the physicochemical properties of the chitosan based bionanocomposite with low wettability and high thermal stability. Besides, the high zone of inhibition of hexagonal and somewhat aggregated zinc oxide nanoparticles reveals their antimicrobial potential against bacteria as well as antioxidant and anticancer activities explain low cell viability of the cancerous cells. Therefore, the bionanocomposite emphasize their application in biomedical research area.

Chapter 6 is concerned with the evaluation of physicochemical properties and characterization of chitosan based bionanocomposite. The study revealed spherical-shaped titanium dioxide nanoparticles exhibits high zone of inhibition against gram negative bacterial strain and good DPPH radical scavenging activity as bionanocomposite. Additionally, the bionanocomposite reveals very less percent cell viability and hence the anticancer activity. The promising results reported in this study clearly demonstrates an exciting opportunity for the bionanocomposite to be utilized in biomedical field of sciences.