



INDIAN INSTITUTE OF TECHNOLOGY GUWAHATI
SHORT ABSTRACT OF THESIS

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Thesis Title: **Preparation and characterization of nanocomposites for biomedical applications**

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SHORT ABSTRACT

The main goal of this study was to develop bioactive and biodegradable hybrid biomaterials with tailored physical, mechanical and biological properties for biomedical applications such as hyperthermia treatment of cancer, wound dressings and bone tissue engineering. In the course of this tryst, some challenging problems in biomaterial processing and analysis were also tackled. To start with, two sets of magnetic bioglass-ceramics [41CaO-44SiO₂-4P₂O₅-8Fe₂O₃-3Na₂O and 15(ZnO,Fe₂O₃)-50SiO₂-20(CaO,P₂O₅)-15Na₂O (mole %)] were optimized for use as thermos-seeds in hyperthermia treatment and contrast agent in magnetic resonance imaging. Work on sol-gel derived nanoporous bioglass and bioglass-ceramics with compositions of 45SiO₂-24.5CaO-24.5Na₂O-6P₂O₅, 24.5CaO-43SiO₂-6P₂O₅-24.5Na₂O-2Fe₂O₃ and 24.5CaO-42SiO₂-6P₂O₅-24.5Na₂O-3Fe₂O₃ (wt.%) gave us an opportunity to understand the sol-gel process to produce fully amorphous bioglass 45S5 and magnetic bioglass. These sol-gel variants offer new opportunities for bioglass in biomedical applications due to their superior bioactivity and physical properties. The combined use of sol-gel and electrospinning technique permitted fabrication of nanofibrous poly vinyl alcohol (PVA)-polyvinyl pyrrolidone (PVP), PVA-bioglass [24.5CaO-43SiO₂-6P₂O₅-24.5Na₂O-2Fe₂O₃ and 24.5CaO-42SiO₂-6P₂O₅-24.5Na₂O-3Fe₂O₃ (wt.%) composites membranes. PVA-PVP blends opens up the possibility of using electrospinning technique to fabricate cost effective interactive wound dressings. The composite membranes of PVA-bioglass and PVA-magnetic bioglass indicate that the flexibility and biocompatible nature of PVA can be exploited for osteoconductive applications such as scaffold guided bone tissue engineering.