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Electrophoretic deposition of chondroitin sulfate-chitosan/bioactive glass composite coatings with multilayer design

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Abstract

Novel chondroitin sulfate (CS) based coatings were produced by electrophoretic deposition (EPD). CS was used as matrix and combined with bioactive glass (BG) particles to produce a series of bioactive composite coatings with potential for orthopedic and dental applications. Furthermore multilayer systems incorporating chitosan were designed and developed to tailor coating composition, bioactivity and degradation. Solutions and suspensions based on CS were developed, and their stability analyzed by means of ζ -potential measurements. EPD conditions (concentration, potential and deposition time) were investigated and determined for CS and BG/CS coatings, as well as for a variety of multilayer systems. Coating morphology, microstructure and composition were studied using SEM, XRD, FTIR spectroscopy and TG-DTA techniques which confirmed the formation of a variety of homogeneous CS based multilayered coatings. Finally, immersion test in simulated body fluid was carried out demonstrating the bioactive behaviour of some of the new systems developed after 2 days of immersion. CS containing coatings are of interest for applications where the combined effects of CS and BG can lead to enhanced tissue regeneration effects.

Keywords: chondroitin sulfate, chitosan, bioactive glass, coating, electrophoretic deposition (EPD)

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