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Abstract

**CORROSION STUDY OF NANO-HYDROXYAPATITE COATINGS ON  
IMPLANT ALLOYS FABRICATED BY ELECTROPHORETIC DEPOSITION**

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Owing to their high mechanical strength and good corrosion resistance, austenitic stainless steel 316L and titanium alloys are often applied in both dentistry and orthopedics as the substrate for manufacturing implant prostheses. In order to increase the biocompatibility of the metallic implants, hydroxyapatite (HAP) is often coated on their surface such that a real bond with the surrounding bone tissue can be formed. Plasma spraying of HAP coatings is currently the only industrial process but long-term stability of the plasma sprayed coatings is an exigent problem because of their high degree of porosities, poor bond strength, non-stoichiometric composition and amorphous structure. In the present study, electrophoretic deposition (EPD) has been attempted for fabricating nano-structured HAP coatings on 316L and titanium alloys. Different shape nano-structured HAP powders (spherical, flake and needle) were used to produce densified coatings which exhibit high corrosion resistance and

adhesion strength. Carbon nanotubes (CNTs) were also used to reinforce the HAP coating for enhancing its hardness and acted as reinforcement networks with the HAP to avoid peeling of the coating layers. The corrosion behavior of the nano-structured HAP coatings formed by EPD in Hank's solution at 37 °C was investigated by means of open circuit potential-time measurement, potentiodynamic polarization technique, and electrochemical impedance spectroscopy. Surface morphology, compositions, microstructure of the HAP coated specimens were investigated by scanning electron microscope, energy dispersive spectroscopy and X-ray diffractometry respectively. Moreover, surface hardness, adhesion strength and biocompatibility of the coatings were also determined. Among the coated specimens, spherical shape HAP on cp Ti by cathodic EPD showed the highest corrosion resistance as evidenced by high pitting potential, a wide passive range, low corrosion current density, increase in impedance value, highest hardness and average weight increment for biocompatibility test.