

Plasma Spray Deposition of Bio-Active Coating on Titanium Alloy (Ti-6Al-4V) Substrate

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Abstract : In the present study, composite coating consisting of hydroxyapatite (HA) + 50 wt% TiO₂ has been developed on Ti-6Al-4V substrate by plasma spray deposition technique. Followed by plasma spray deposition, detailed surface roughness and microstructural characterization were carried out by using optical profilometer and scanning electron microscopy (SEM), respectively. The composition and phase analysis were carried out by energy-dispersive X-ray spectroscopy analysis, and X-ray diffraction (XRD) technique, respectively. The bio-activity behavior of the uncoated and coated samples was also compared by dipping test in Hank's solution. The average surface roughness of the coating was 10 μm (as compared to 0.5 μm of as-received Ti-6Al-4V substrate) with the presence of porosities. The microstructure of the coating was found to be continuous with the presence of solidified splats. A detailed XRD analysis shows phase transformation of TiO₂ from anatase to rutile, decomposition of hydroxyapatite, and formation of CaTiO₃ phase. Standard dipping test confirmed a faster kinetics of deposition of calcium phosphate in the coated HA+50% wt.% TiO₂ surface as compared to the as-received substrate.

Keywords : titanium, plasma spraying, microstructure, bio-activity, TiO₂, hydroxyapatite

Conference Title : ICPSE 2016 : International Conference on Plasma Surface Engineering

Conference Location : Paris, France

Conference Dates : August 22-23, 2016