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## Preparation, scratch adhesion and anti-corrosion performance of TiO<sub>2</sub>-MgO-BHA coating on Ti6Al4V implant by plasma electrolytic oxidation technique

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### Abstract

Bovine hydroxyapatite (BHA) (from cortical bone), was selected as the main electrolyte for plasma electrolytic oxidation (PEO) on Ti6Al4V implant. The prepared PEO coatings were examined by X-ray diffraction, field emission scanning electron microscope and energy-dispersive X-ray spectroscopy. The surface roughness, adhesion strength, wettability, surface energy and corrosion behaviour of the film were also investigated. The results show that the oxide layer (26m) formation on the Ti6Al4V was rough and porous. The micro-pores were filled with anatase TiO<sub>2</sub>, cubic MgO and hexagonal BHA particles. The porous structures and the compound particles were mainly composed of Mg, O, Ca, P, Ti, Na and Al. Unlike previous coatings produced from calcium and phosphorus inorganic solutions, the coating formation from a newly developed bovine bone-derived HA electrolyte revealed an additional MgO phase in the coating layer. Moreover, higher amount of single phase hexagonal crystalline BHA phase with a Ca/P ratio of 1.1 was achieved with a single PEO process. A film-to-substrate adhesion strength of 1862.24 mN and scratch hardness of about 4.1 GPa was achieved from this method. The TiO<sub>2</sub>/MgO/BHA film exhibited better wettability, higher surface energy and superior corrosion resistance compared to the bare Ti6Al4V substrate.

### Keywords

**Author Keywords:** Bovine hydroxyapatite; plasma electrolytic oxidation; Ti6Al4V; adhesion strength; corrosion resistance

**KeyWords Plus:** MICRO-ARC OXIDATION; MAGNESIUM ALLOY; HYDROXYAPATITE; FABRICATION; PHOSPHATE; TITANIUM; BEHAVIOR; CALCIUM

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