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## Comparative study on electrocrystallization of calcium phosphate ceramics on commercially pure titanium and selective laser melting titanium

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### Abstract

The present study investigates the electrocrystallization processes of calcium phosphate ceramics on commercially pure titanium (CP-Ti) and selective laser melting produced pure titanium (SLM-Ti) parts. The microstructure investigations show that SLM-Ti parts have martensitic  $\alpha'$  microstructure with more surface defects, whereas CP-Ti samples exhibit equiaxed  $\alpha$  microstructure. The comparative electrochemical measurements reveal that the CaP depositions on both substrates exhibit the diffusion-controlled 3D instantaneous nucleation mechanism. However, the polarization potential recorded with SLM-Ti sample is obviously lower than that with CP-Ti sample at the initial stage of CaP deposition process, during which concentration polarization can be neglected. This result suggests that the overpotential caused by the slow electrocrystallization process was decreased on SLM-Ti samples since the SLM process develops more surface defects that can act as nucleation centers in the electrocrystallization process.

Keywords: Electrocrystallization; Defects; Selective laser melting; Pure titanium

### 1. Introduction

Commercially pure titanium is widely used in the field of biomedical implants, such as dental and orthopedic implants, but there are still disadvantages, such as poor osseointegration and low wear

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