

**The microstructural and in vitro characteristics of hydroxyapatite coating fabricated using Nd-YAG laser**

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**Abstract**

Hydroxyapatite (HAP) is the most researched calcium phosphate material in the field of biomaterials to be used for bone re-engineering applications; given its attractive properties. Plasma spraying is the best available industrial method that can be used to deposit HAP coatings on metallic substrates. However, this process is sustained with high heat inputs which decompose HAP into secondary phases. These phases are undesirable for biomedical applications. Lasers are sued as secondary post-laser curing step where they are used to improve the crystallinity of these coatings. The purpose of this study was to establish the optimised setting process parameters necessary for direct laser melting process. Nd-YAG laser was used to directly melt HAP powder beds preplaced on Ti-6Al-4V. The produced coatings were characterised with preserved, mixed morphologies of HAP crystallites that sat on the surface of the coating. These crystals were suspended on the long and short titanium needles according to SEM images. XRD results indicated a mixture of HAP and TTCP in the coating while TEM conclude a hexagonal atomic packing. These results indicated that in addition to laser power and scanning speed, the angle at which the laser beam interacts with material is also a necessary parameter to optimise.