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Microstructural Characterization of Micro-Textured Titanium Surfaces

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ABSTRACT

This paper presents the results of a multi-scale microstructural characterization of micro-textured Ti-6Al-4V surfaces that are used in biomedical implants. The hierarchies of substructural and microstructural features associated with laser micro-texturing, polishing and surface blasting with alumina pellets are elucidated via atomic force microscopy (AFM), transmission electron microscopy (TEM), scanning electron microscopy (SEM) and optical microscopy (OM). The nano-scale roughness profiles associated with the different surface textures are elucidated via AFM. Sub-micron precipitates and dislocation substructures associated with wrought processing and laser processing are revealed by TEM. Micro- and meso-scale images of the groove structures are then discussed using OM and SEM. The implications of the results are discussed for the optimization of laser processing schemes for the fabrication of micro-textured surfaces that will facilitate the self organization of proteins, and the attachment of mammalian cells to the Ti-6Al-4V surfaces in biomedical implants.