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 for the different surface textures are characterized via AFM. Sub-micron precipitates and dislocation substructures associated with wrought processing and laser processing are revealed by TEM. OM and SEM micro- and meso-scale images of the groove structures and then described before discussing the implications of the result for the optimization of laser processing schemes. The implications of the results are examined 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.