Title: Wetting behaviour of femtosecond laser textured Ti-6Al-4V surfaces

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Abstract: The aim of the present work was to investigate the wetting behaviour of biomedical grade Ti-6Al-4V alloy surfaces textured by a femtosecond laser treatment. The material was treated in ambient atmosphere using an Yb: KYW chirped-pulse-regenerative amplification laser with a wavelength of 1030 nm and a pulse duration of 500 fs. Four main types of surface textures were obtained depending on the processing parameters and laser treatment method. These textures consist of: (1) nanoscale laser-induced periodic surface structures (LIPSS); (2) nanopillars; (3) a bimodal roughness distribution texture formed of LIPSS overlapping microcolumns; (4) a complex texture formed of LIPSS overlapping microcolumns with a periodic variation of the columns size in the laser scanning direction. The wettability of the surfaces was evaluated by the sessile drop method using distilled-deionized (DD) water and Hank's balanced salt solution (HBSS) as testing liquids. The laser treated surfaces present a hydrophilic behaviour as well as a high affinity for the saline solution, with equilibrium contact angles in the ranges 24.1-76.2. for DD water and 8.4-61.8. for HBSS. The wetting behaviour is anisotropic, reflecting the anisotropy of the surface textures. (c) 2012 Elsevier B.V. All rights reserved.

Author Keywords: Wetting behaviour; Femtosecond lasers; Surface texturing; Surface anisotropy; Ti-6Al-4V implants

Keywords Plus: Biological Model Fluids; AL2O3-TIC Ceramics; Titanium Implants; Contact Angles; Solid-Surfaces; Power-Law; Irradiation; Morphology; Ablation; Mineralization

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Funding:

<table>
<thead>
<tr>
<th>Funding Agency</th>
<th>Grant Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fundação para a Ciência e a Tecnologia (FCT)</td>
<td>SFRH/BD/61002/2009</td>
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<tr>
<td>Programme d’Actions Universitaires Integreees Luso-Francaises (PAUILF)</td>
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SDP - Serviço de Documentação e Publicações
Citation: CUNHA, Alexandre; SERRO, Ana Paula; OLIVEIRA, Vitor; ALMEIDA, Amelia; VILAR, Rui; DURRIEU, Marie-Christine - Wetting behaviour of femtosecond laser textured Ti-6Al-4V surfaces. Applied Surface Science. ISSN 0169-4332. Vol. 265 (2013), p. 688-696.