Laser-Induced Periodic Surface Structures (LIPSS) generation on AISI 316L for inhibition of Biofilm Growth

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Nano-structured metallic surfaces have been used to improve some material properties, including the cell proliferation on the substrate surface [1]. AISI 316L stainless steel is a biomaterial widely used for dental and orthopedic implants. However, some studies have shown infections in the human organism in the region of implanted components for a long time. The objective of this study was to evaluate the influence of the LIPSS on 316L surface in the inhibition of the biofilm growth. For this, the AISI 316L stainless steel bar, polished previous, with diameter of 3.0 mm, was submitted to texturing, using a 532 nm Nd: YAG laser (Coherent, Corona), 20W maximum average power (P), 100ns pulse duration (Tp) and 5kHz repetition rate (f); it followed of surface characterizations by Scanning electron microscopy (SEM) and X-ray diffraction (XRD). After, E. coli (ATCC 25922) biofilm was fixed on the texturized surface, and its growth was evaluated by SEM. It was observed the formation of the LIPSS on the metallic surface, with the presence of periodic structures in all analyzed conditions, without significant presence of the oxides in this region. Concerning of bacterial adhesion and growth, it was observed a reduction of the bacteria activity up to 37% when compared to the untreated material (standard sample). Thus, it was concluded a positive effect of the LIPSS present on the metallic substrate to inhibition the biofilm growth. It is an indication of the improve both material bioactivity and corrosion resistance of the texturized AISI 316L to applications in implanted components.

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References:

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