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Biotribological behaviour evaluation of the ISO 5832-1 stainless steel for biomedical applications treated by optical fiber laser

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The present study evaluated the influence of an optical fiber laser surface treatment process on the tribological behaviour of the ISO 5832-1 austenitic stainless steel (SS) on the coefficient of friction and coefficient of wear in ball-cratering wear tests. For comparison reasons, surfaces non treated by laser were also evaluated. A phosphate buffer solution (PBS) was used as electrolyte. Samples of this biomaterial were treated by alternating the laser frequency in order to find out a condition that improves its tribological behaviour. Micro-abrasive wear tests were carried out with a ball of AISI 316L SS (diameter of 25.4 mm – 1”), used as counter-body, and abrasive slurries prepared with abrasive particles of Al₂O₃ and distilled water. The sample's surfaces finishing were analyzed by optical and electronic (SEM-EDX) microscopy. The surface characterization showed microstructure modification due to the high temperatures involved in the laser process and the micro-abrasive wear results indicated that the tribological behaviour is influenced by the frequencies values used for the laser surface treatment.

Key-words: Biomaterials, stainless steel, optical fiber laser, texturing, micro-abrasive wear.

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