Plasma treatments for surface cleaning of orthopaedic implants

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Dublin City University, Ireland — The cleaning process of manufacturing induced contamination from orthopaedic implants is an essential step to achieve surface biocompatibility and comply cleanliness requirement of implants for surgery. The current cleaning process involve removal of such residues by exposure to chemical detergents. An alternate approach to this process is to exploit low temperature plasmas. In this study, we investigated the removal of organic and inorganic process consumables using radio frequency atmospheric pressure multi-jet system. The plasma is operated in He/O₂ gas mixture, with and without admixture of water vapour. The discharge chemistry is diagnosed and optimized using optical emission spectroscopy and laser induced fluorescence. The cleaning technique is applied on the polished medical grade and aluminum oxide grit blasted titanium metal samples, which is analogue to one used in traditional metal implants. The surface cleaning is further examined and validated by the X-ray Photoelectron Spectroscopy (XPS), Scanning Electron Microscopy (SEM) and Fourier-Transform Infrared (FTIR) spectroscopy analysis. The results validate plasma cleaning as a viable alternative to wet-detergent cleaning.

1This work has emanated from research conducted with the financial support of Science Foundation Ireland (SFI) under grant number 12/RC/2278 and 17/SP/4721, and co-funded by the European Regional Development Fund and SFI under Ireland’s European Structural and Investment Fund. This research has been co-funded by the 3D Printing Centre of Excellence, Johnson Johnson Services Inc., and DePuy Synthes.

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Date submitted: 04 Jun 2019