

Abstract Submitted
for the GEC15 Meeting of
The American Physical Society

Optical Emission Spectroscopy in PECVD Helps Modulate Key Features in Biofunctional Coatings for Medical Implants MIGUEL SANTOS, PRAVEESUDA MICHAEL, ELYSSE FILIPE, PhD student, STEVEN WISE, Postdoctoral Scientist, MARCELA BILEK, Professor, THE UNIVERSITY OF SYDNEY COLLABORATION, THE HEART RESEARCH INSTITUTE COLLABORATION — We explore the use of optical emission spectroscopy (OES) diagnostic tools as a process feedback control strategy in plasma-assisted deposition of biofunctional coatings. Hydrogenated carbon nitride coatings are deposited on medical-grade metallic substrates using radio-frequency (rf) discharges sustained in $C_2H_2/N_2/Ar$ gaseous mixtures. The discharge is generated by capacitively coupling the rf power (supplied at $f = 13.56$ MHz) to the plasma and the substrates are electrically biased using a pulse generator to provide microsecond square profiled pulses at voltages in the range $|V_{\text{bias}}| = 250 \text{ V} - 1000 \text{ V}$. Nitrogen content and CN bonding configurations in the coatings follow similar trends to those of CN radicals and nitrogen molecular ions in the discharge. OES is used as a non-intrusive diagnostic technique to identify a suitable window of process parameters and ultimately achieve biofunctional interfaces compatible with current clinical demands. Importantly, we demonstrate that key features of the coatings can be modulated and made suitable for blood and/or tissue contacting medical implants, such as coronary stents and orthopaedic implants. The coatings are mechanically robust, inherently non-thrombogenic and can be readily modified, enabling an easy functionalization through the immobilization of biological molecules in a bioactive conformation.

Miguel Santos
PhD student

Date submitted: 19 Jun 2015

Electronic form version 1.4