Abstract

During this MSc Thesis, adsorption phenomenon of two basic blood plasma proteins, albumin (HSA) and fibrinogen (Fib), on organic and inorganic thin films was studied. Spectroscopic Ellipsometry (SE) was implemented for the study of the optical properties of the candidate biomaterials and the adsorbed protein layers. The first aim of this study was to testify if poly(3,4-ethylene dioxythiophene)-poly(styrene sulfonate) (PEDOT:PSS), which is to the forefront of the field of conducting polymers, could be used as a biomaterial for nanomedicine applications. The results hold great promise for the future, due to the fact that PEDOT:PSS supports protein adsorption. Moreover, PH1000 has proven to be more haemocompatible than FET. The second objective of this study was to assess if polycaprolactone, poly(lactic-co-glycolic acid (PCL-PLGA) triple layer thin films could be used for drug delivery applications in terms of their haemocompatibility. The results clearly showed that the above polymer substrates loaded with dipyridamole support HSA adsorption, while simultaneously repel Fib molecules, which indicated that it is impossible for a thrombus to be formatted. Several works have dealt with the haemocompatibility and biocompatibility of amorphous hydrogenated carbon (a-C:H) thin films. The last aim of this work was to study the influence of rinsing and drying procedures to the protein structure and configuration in the interface of a-C:H thin films. The comparison of ex situ and in situ results revealed that ex situ methodology results to a collapsed layer of probably denatured proteins which is much thinner than the native protein matrix observed in the in situ experiments. Moreover, Multiwavelength Ellispometry (MWE) was implemented for the real time monitoring of the protein adsorption on a-C:H thin films. The fitting results showed that protein adsorption phenomenon is too fast and reaches the equilibrium state at the first seconds. In addition, Fib molecules were proven to be anisotropic.