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Plasma Polymers for Biomedical Applications

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There exists an abundant literature on polymers used for biomedical applications. However, the research described in the present talk deals with the plasma (co-) polymerization of different organic precursors for surface modifications of a variety of substrates in order to tailor the surface physico-chemical properties for tuneable biomolecule-surface interactions required for a wide range of biomedical applications such as antifouling properties, controlled drug delivery systems (DDS), cell-surface interactions for tissue engineering applications, etc. A low pressure inductively excited plasma, and a custom made open air DBD APPJ have been used for the plasma (co-) polymerization. Furthermore with the help of a coaxial double tube configuration of APPJ, one can minimize the influence of the entrainment of air in an open-air system in order to avoid enhanced plasma fragmentation and loss of the retention of the functional groups of the precursors, which is usually required for biomedical applications. The stability to washing with water and PBS of the deposited organic plasma polymers obtained with the APPJ at two different frequencies i.e. at 18 kHz and at 13.56 MHz will be compared. Examples such as multilayered DDS obtained from the plasma copolymerization of PCL-PEG coatings on collagen for controlled release of carboplatin for anticancer therapies and *in-vitro* experiments will be presented. In the near future, DDS loaded with carboplatin will be tested *in-vivo* on mice infected with mouse colon cancer CT26 and ovarian cancer cells OVCAR-3. Another example presented in the talk will be the deposition of biocompatible biodegradable PEG-PCL copolymers on Calcium Phosphates (CaPs) scaffolds, which are suitable biomaterial for bone regeneration materials, in order to control the kinetics of drug release.