FABRICATION OF BIOSENSING COATINGS WITH TAILORED FUNCTIONALITY BY USING ATMOSPHERIC-PRESSURE PLASMA POLYMERIZATION

E. MAKHNEVA[1], L. BARILLAS[1], Z. FARKA[2], M. PASTUCHA[2], P. SKLADAL[2], K.-D. WELTMANN[1], K. FRICKE[1]

[1]Leibniz Institute for Plasma science and Technology (INP), Greifswald, Germany
[2]Central European Institute of Technology (CEITEC), Brno, Czech Republic

Various types of biosensors are convenient tools for fast, economic and user friendly analysis of complex biological samples. For stable biomodification of the sensing surfaces, a thin functional layer is required to provide a sufficiently high surface reactivity towards the adopted bioreceptor as well as good stability in the presence of sample matrix.

We report on a novel method for the preparation of thin reactive plasma-polymerized (pp) films, using atmospheric pressure plasmas, for biosensing applications. Our original approach for generating pp films is a versatile, fast and eco-friendly procedure. Three different types of pp films were developed and characterized. Chemical composition, morphology and stability in water of the obtained plasma polymerized films were carefully scrutinized. The pp films provided unique functionality and excellent level of adhesion to the substrates. Furthermore, after an initial thickness loss during washing, which is based on non-polymerized oligomers, prolonged immersion in water (up to 120 h) did not indicate any significant thickness losses or deterioration of the sensing properties.

SPR immunosensors were successfully developed using cost-efficient model pair of AL01 antibody and HSA antigen. The pp films provided an excellent platform for the efficient immobilization of antibody molecules and the obtained immunosensors showed selective and high response towards the analyte, excellent regenerability and level of stability. A limit of detection of 50 ng/mL of HSA was achieved for all of the developed immunosensors. The developed immunosensors provided a linear response in the range of 50 ng/mL to 20 µg/mL concentrations of HSA. Hence, pp film–based immunosensors exhibited performances similar to widely used SAM– or CMD–based immunosensors but with enhanced level of stability and regenerability.