Plasma polymers with adjustable wetting behavior

J.Berndt, H. Acid, E.Kovacevic, L. Boufendi
GREMI, Université d'Orléans, 14 rue d'Issoudun 45067 ORLEANS Cedex 2

We witness nowadays the expansion of a new and exciting field of plasma-research: plasma-medicine. One important aspect of this field is related to the controlled production of so-called biomaterials, i.e. materials used for the control of bio-interfacial interactions. One factor which is decisive for many applications in this field concerns the wettability of surfaces [1]. The control of the hydrophobicity or hydrophilicity is for example crucial for the production of antifouling coatings, for the design of microfluidic elements or for newly developed "lab on a chip" applications. The wettability of a surface commonly depends on two factors, the surface chemistry and the surface roughness or to use a more general term the surface topography [2]. We report in this contribution about the use of plasmas and in particular low temperature plasmas for the synthesis of thin polymer films with adjustable wetting characteristics. In the focus of this work is the investigation of polymerisation processes in pulsed discharges. The influence of pulse frequency and duty cycle on the plasma and on the properties of the plasma synthesized polymers is investigated. An important issue concerns here the interplay between volume polymerisation processes leading to the formation of nanoparticles and the deposition of thin polymer films on surfaces exposed to the plasma. The post treatment of the resulting polymer coatings by means of different kinds of plasmas and its influence on the wetting behaviour is investigated. The results show that the wetting behaviour can be adjusted (from superyhdrophobic to superhydrophilic) by the proper choice of the post treatment method. The influence of the post treatment on the polymers is analyzed by means of XANES, FTIR spectroscopy.

References

[1] J. Drelich, E. Chibowski, D. Desheng Meng and K. Terpilowskic Soft Matter **7**, 9804 (2011)
[2] L. Gao and Th. J. McCarthy J. AM. CHEM. SOC. **128**, 9052 (2006)