Plasma based deposition of patterned organic fluorine-free (super)hydrophobic-(super)hydrophilic surfaces

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One important aspect of biomedical research is related to the controlled production of so-called biomaterials. Plasma technology is known to be an important tool for the production and surface modification of synthetic polymers used for the control of bio-interfacial interactions [1]. Either as thin films, as nanoparticles or nanocomposites: plasma produced or processed materials have found an increasing number of applications in biomedical research An important factor for many applications is the wettability of the surfaces. 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].

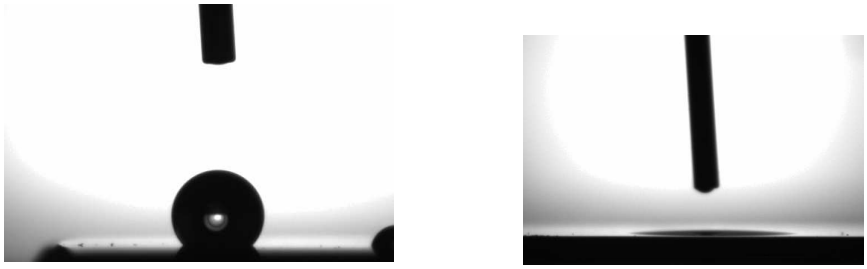

Figure 1*: Water droplets on plasma polymerized surfaces. a) shows a surface containing a high amount of nanoparticles. (b) shows the same surface after post process plasma treatment.*

In this contribution we will focus on the production of carbonaceous coatings deposited by means of a capacitively coupled low temperature plasma. The experiments show that the hydrophobicity can be significantly enhanced due to the controlled deposition of (plasmapolymerized) nanoparticles (figure 1a). The post treatment of such surfaces with a (e.g.) nitrogen plasma leads to an opposite effect: to surfaces with a strong hydrophilic character (figure 1b). Depending on the treatment time and the plasma parameters it is possible to gradually change the contact angle. The combination of both methods allows a simple production of materials with alternating patterns of (super)hydrophobic and (super)hydrophilic surfaces as they can be used for example in new lab on chip applications [3]

References

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