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### **Application of plasma polymer nanoparticles for biomimetic coatings**

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Plasma polymer nanoparticles (NPs) were observed already in the 70s of the last century when the gas pressure over 100 Pa was used for plasma polymerization. This phenomenon became later widely studied as „complex plasmas“, however, little attention was paid to the efficient way of collecting NPs and using them for fabrication of nanostructured surfaces. This drawback may be overcome using gas aggregation cluster source (GAS) equipped with planar magnetron and powered by RF power supply. In GAS, NPs are fabricated and then transported by a gas flow into a separate vacuum chamber where they are deposited on a substrate. In our laboratory, RF sputtering of PTFE and nylon 6,6 was proved successful in preparation of NPs and NP coatings. Plasma polymerization of n-hexane and HMDSO was shown to produce NPs as well. In this contribution, fine tuning of the NP size is demonstrated on an example of the GAS operating in the mixture of HMDSO with Ar (1: 10). The NPs were found to be of an organic character and their chemical composition was remarkably stable regardless the experimental parameters (power or aggregation length). In contrast, the NP size was very sensitive to the discharge power and the aggregation length. The increase of power from 20 W to 80 W led to the decrease of the NP size from 250 nm to 76 nm (at the constant aggregation length of 10 cm). Even larger range from 250 nm to 45 nm was obtained when the aggregation length was changed from 10 to 4 cm (at constant power of 30 W). Manipulation with both parameters during the same run allowed to deposit controllable amounts of differently-sized NPs that opened broad possibilities for the production of nature-inspired biomimetic coatings with multi-scale roughness. For example, triple scale NPs overcoated with hydrophilic SiO<sub>2</sub> or hydrophobic plasma polymer of HMDSO showed superhydrophilic properties or superhydrophobic behavior with a very low adhesion force.

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#### **Keywords**

plasma polymer  
nanoparticles