Hydration of Hydrophobic HMDSO Plasma Polymers

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Plasma polymerization is widely used to generate functional coatings. As the deposition of plasma polymers depends on gas phase and surface processes, a control over both parameters is required in order to adjust the functionality as well as the porosity of such coatings. For plasma polymers formed from pure hexamethyldisiloxane (HMDSO) discharges it was found that in a broad parameter range the density scales with the energy density at the surface highlighting the importance of surface processes for the densification of these coatings. A minor role is attributed to the momentum transfer (constant in this range), while gas phase processes, i.e. fragmentation, seem to be important. The wettability of pp-HMDSO coatings is found to be directly related to the film density due to the residual carbon content.

In addition, also the long term stability of the wetting properties of plasma polymerized HMDSO films has been investigated. The performance of the coatings differed markedly depending on the applied plasma parameters and the storage conditions (stored in dry air, humid air or in water). When stored in water all examined coatings showed a strong decrease of the water contact angle in the first few days of storage before reaching a constant value. This suggests an effective hydration of the HMDSO plasma polymers that is enabled by the SiO backbone. Such hydrophobic coatings thus become interesting as barrier layers for controlled drug release and for their sorption properties of amphiphilic molecules.

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