SiO2 deposition by microplasma jets

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Organic and inorganic silicon dioxide films have been deposited by means of an atmospheric pressure microplasma jet. Tetramethylsilane (TMS), oxygen, and hexamethyldisiloxane (HMDSO) are injected into argon as the plasma forming gas. In case of TMS injection, inorganic films are deposited if an admixture of oxygen is used or if the substrate temperature exceeds 200°C. In case of HMDSO injection, inorganic films can be deposited at room temperature even without any oxygen admixture: at low HMDSO flow rates (< 0.1 sccm), SiOxHz films contain no carbon and exhibit an oxygen to silicon ratio close to 2 according to X-ray photoelectron spectroscopy (XPS). At high HMDSO flow rates (> 0.1 sccm), SiOxCyHz with up to 21 % of carbon are obtained. The transition between organic to inorganic film is confirmed by Fourier transformed infrared spectroscopy (FTIR). The deposition of inorganic SiO2 films from HMDSO without any oxygen admixture is explained by an ion-induced polymerization scheme of HMDSO.