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High Rate Deposition of SiO2-based Protective Coatings by MW-PECVD on Polycarbonate

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Thin transparent films based on silicon dioxide are of special interest as abrasion and scratch resistant layers. In order to reach a high scratch resistance a minimum film thickness of 3 - 5 µm is required. Besides being applicable on large substrates the deposition process has to reach high deposition rates of a few µm/min to be economically feasible.
In this work a high rate microwave plasma-enhanced chemical vapor deposition process (MW-PECVD) of silica films at low pressure is studied. A mixture of oxygen and hexamethyldisiloxane (HMDSO) is fed into the reaction chamber in an upstream configuration. The plasma is generated using the Duo-Plasmaline principle and two magnetrons at 2.45 GHz with 3 kW in the cw mode. Polycarbonate (PC) sheets with 10 × 15 cm² are used as substrates. Due to the scalability of the Duo-Plasmaline the deposition process can also be applied on larger substrates.
The deposition process has been studied for a wide range of parameters including microwave power as well as gas and precursor flow rates. High deposition rates of up to 25 µm/min have been achieved with a constantly high film quality.
In this contribution, the deposition process is presented and the film properties like homogeneity, adhesion to the PC, abrasion and scratch resistance, its optical properties and chemical composition, measured by means of FTIR-spectroscopy, are being discussed regarding the deposition parameters.

Keywords
MW-PECVD
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Polycarbonate