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**Plasma chemistry and scaling parameter in high-current dielectric barrier discharges used for plasma-enhanced CVD of $SiO_2$ on polymers** R. ENGELN, S. WELZEL, Eindhoven University of Technology, Eindhoven, The Netherlands, S.A. STAROSTIN, H. DE VRIES, FUJIFILM Manufacturing Europe B.V., Tilburg, The Netherlands, M.C.M. VAN DE SANDEN, Dutch Institute for Fundamental Energy Research, Nieuwegein, The Netherlands — Plasma-enhanced roll-to-roll processing of polymeric substrates in diffusive, air-like dielectric barrier discharges containing organo-silicon precursors has been shown to yield high-quality $SiO_2$ thin films. To scrutinise the link between the comlex precursor chemistry and the film formation complementary studies of (i) the discharge evolution, (ii) the gas phase composition, and (iii) the film properties of the silica-like films were carried out. Spatially and time-resolved optical emission provided details about the evolution of the ionisation waves in the discharge. Ex-situ Fourier-transform infrared (IR) absorption spectroscopy (AS) was implemented to study the gas phase downstream as function of injected power and hence the level of precursor consumption. Additionally, time-resolved in-situ IR laser AS was used to assess specifically the decomposition of HMDSO and TEOS. The results were corroborated by XPS and SE analysis of the layers deposited. Typically, a H-N-O chemistry in the presence of traces of hydrocarbons is observed. It transpires that the CO gas phase density is closely linked with the growth rate and the carbon content of the $SiO_2$ films. More importantly, the trends observed can be described by a scaling parameter.

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