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**In-situ FTIR-ATR spectroscopic investigations of atmospheric-pressure plasma modification of polyolefin thin films**Zohreh Khosravi<sup>1</sup>, Alena Hinze<sup>2</sup>, Claus-Peter Klages<sup>2</sup><sup>1</sup>Institut für Oberflächentechnik,, Braunschweig, Germany <sup>2</sup>Institut für Oberflächentechnik,TU BS, Braunschweig, Germany

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This contribution reports on plasma treatment of polyolefin surfaces by dielectric barrier discharges (DBDs) in virtually oxygen-free nitrogen-containing gases, studied *in situ* by Fourier transform infrared spectroscopy in the attenuated total reflection mode (FTIR-ATR). These investigations are aiming at an understanding of the chemical processes eventually leading to the appearance of primary and secondary amino groups on the surface and they are expected to allow an improvement of process conditions for various applications where a uniform or patterned plasma-chemical amination of an inert polymer surface is desired. Polyolefin thin films of thicknesses between 20 and 100 nm were prepared directly on ZnS ATR crystals by spin-coating from hot solutions of linear low-density polyethylene (LLDPE), low density polyethylene (LDPE), or polypropylene (PP) in aromatic hydrocarbons like xylene or decalin. After the exposure to the afterglows of DBDs in N<sub>2</sub> or in mixtures of N<sub>2</sub> with H<sub>2</sub> or NH<sub>3</sub>, infrared spectra were taken *in situ* under inert conditions and after controlled exposure to various reagents, resp., such as water vapor or oxygen. In order to unravel the complex spectra which are generally due to several functional groups with overlapping vibrational bands, an exchange reaction with heavy water vapor (D<sub>2</sub>O) was applied in order to identify groups which are known to exhibit a rapid H/D exchange like >N=H (imine), -NH<sub>2</sub> (prim. amine), >NH (sec. amine), -CO-NH<sub>2</sub> (prim. amide), using characteristic ratios of wavenumber ratios for corresponding vibrational bands in the deuterated and the protonated compound. Tentative assignments of vibration bands to imino, amino, and amido groups will be made and an interpretation of the results in terms of elements of a chemical mechanism will be presented.

**Keywords**

Dielectric barrier discharges  
polymer surface modification  
*in situ*  
FTIR-ATR  
amino groups