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Comparison of atmospheric pressure radio frequency plasma slit-jet with glide arc

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Non-thermal atmospheric pressure plasma jets represent a simple versatile technology for the modification of material nanostructure and surface chemistry. We have compared, by plasma diagnostics and analysis of plasma-modified polypropylene, two different atmospheric pressure plasma jets, a novel radio frequency (RF) plasma slit-jet with the plasma width of 150 mm (scalable to 300 mm) operating in argon and the commercial glide arc jet (plasma width of 10 mm) from SurfaceTreat operating at 50 Hz in flowing air. Both systems were studied also with additives, gaseous or volatile compounds, enabling to tune the conditions of plasma treatment or plasma enhanced chemical vapor deposition (PECVD). Optical emission spectroscopy revealed that glide arc system was producing much more dissociated reactants and the plasma treatment of polypropylene in dry air or with additives like ethanol or isopropanol produced surfaces with more functional groups. The advantage of the RF plasma slit-jet can be seen in its larger width, a better treatment uniformity and less dissociated added compounds, i.e. higher retention of the precursor structure in the case of PECVD.

Keywords

plasma jets
atmospheric pressure
plasma treatment
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