

Abstract Submitted
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Experimental study and modeling of plasma-polymer interactions¹ ANATOLY NAPARTOVICH, YURI AKISHEV, MIKHAIL GRUSHIN, NIKOLAY DYATKO, IGOR KOCHETOV, NIKOLAY TRUSHKIN, SRC RF TRINITI, TRAN DUC, FRANCOISE SOMMER, Biophy Research S.A. — Atmospheric pressure discharges producing high non-thermal plasma were employed for polypropylene (PP) film surface. Two types of discharges were examined: pulse periodic streamer-like discharge in air flow and glow discharge in nitrogen. Water/surface contact angles before and after plasma treatment were measured. A pronounced improvement of surface wettability is observed, and its dependence on plasma exposer is found. This effect is stronger for nitrogen glow discharge processing. Ageing of surface properties proceeds slower after nitrogen plasma treatment. XPS method was implemented to characterize changes in functional groups on polymer interface. The theoretical models were developed for plasma chemistry induced in air by streamer-like discharge and for plasma-surface interactions governed by chemical radicals. Processes of hydrogen abstraction from the surface, secondary reactions with formed active sites, and finally backbone scission are considered. Satisfactory agreement with respect to after treatment composition of functional groups on the surface is achieved between results of XPS measurements and theoretical model predictions. The plasma-surface interaction model provides a solid basis for attacking the ageing problem.

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Anatoly Napartovich
SRC RF TRINITI

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