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Evaluation of biological safety for plasma-polymer treatment.Victor Vasilets¹, Valentina Egorova², Viktor Sevastianov²

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Plasma processing is widely used now for treatment and modification of different materials in car industry (treatment of bumpers to improve adhesion), microelectronics (etching and removal of polymer resist films), medicine (plasma knife, healing and tissue regeneration, treatment of polymer biomaterials to improve biocompatibility), textile industry (treatment before painting), polymer membranes (modification to improve selectivity), packing industry (surface modification to improve printing) and etc. However biological safety of plasma processing was not studied in details yet. As a result of plasma treatment different dangerous or toxic compounds could be synthesized.

In this study a toxicological effects of the typical plasma treatment processes of polymers using dielectric barrier discharge (DBD) atmospheric plasma devices were investigated. Blood haemolysis (erythrocytolysis), cell toxicity and cell proliferation techniques were used for evaluation the risk of toxic effects of plasma processing. The experimental results show that treatment of polymers at atmospheric pressure with typical DBD plasma parameters could cause the formation of toxic compounds on the surface. Optimization of plasma parameters based on short term and long term toxicological experiments was done to obtain safety plasma-polymer processing. This work was supported by Russian Foundation for Basic Research; grant #08-03-00345 and 09-02-00162.

Keywords

atmospheric plasma

polymers

toxicity

cell proliferation