

Abstract Submitted
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Polymer processing by electron beam generated plasmas in argon, oxygen, nitrogen environments and their mixtures¹ EVGENIYA LOCK², SCOTT WALTON, RICHARD FERNSLER, Naval Research Laboratory — Polymers have unique physio-chemical properties that make them attractive for organic electronics applications. However, their inherent low surface energy can be problematic. Wet chemical processing, flames and plasma treatments have been successfully applied to alter the polymer surface properties but plasma treatments are often favored because they change only the surface without altering the bulk properties. Plasmas can also cause roughening or even surface damage. Electron beam generated plasmas have several unique features that distinguish them from the conventional discharges - intrinsically low electron temperature (< 1 eV), resulting in smaller plasma potentials and in lower incident ion energies (1-5 eV). These energies are comparable with the bond strengths found in most polymers, so they are sufficient to invoke chemical surface modification with limited morphology changes. In this study, polymer modifications resulting from electron beam plasma generation in argon, oxygen and nitrogen environments and their mixtures are investigated. The polymers of interest include polystyrene, polymethylmetacrylate and ultra-high molecular weight polyethylene. The effects of the plasma process parameters including treatment time and duty factor, as well as mixture composition on surface energy, chemistry and morphology are presented.

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