

Aging of Corona-treated Polypropylene

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Industrial “coronas” (a dielectric barrier discharge sustained in air) are the most widely used plasma treatment in the world for improving the adhesion and wetting properties of polymeric materials. Industrial coronas cause the oxidation and chain scission of polymer surfaces, resulting in the formation of water-soluble low-molecular-weight oxidized materials (LMWOM). Many oxidized polymers undergo some form of “aging” after treatment, which is defined as a change in surface properties as a function of storage time and storage temperature. For biaxially oriented polypropylene (BOPP) films, aging is characterized by no change in surface topography as imaged by atomic force microscopy (AFM), a decrease in surface oxidation as detected by x-ray photoelectron spectroscopy (XPS or ESCA) and static secondary ion mass spectrometry (SIMS), but no statistically significant increase in water contact angles. This seemingly unusual aging behavior is explained both by the special properties of LMWOM and by the nature of contact angle measurements on water-soluble surfaces.

Reference: To be published as an extended abstract in the Proceedings of the 41st Annual Meeting of The Adhesion Society