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Effect of VUV Radiation on Fluorination of Polypropylene in Low Pressure Plasmas[1] YANG YANG, Iowa State University, MARK STROBEL, SETH KIRK, 3M, Inc., MARK J. KUSHNER, Iowa State University — Affixing fluorine to the surface of polypropylene (PP) lowers surface energy and increases hydrophobicity. One such fluorination process is the immersion of PP sheets in a low pressure, F_2 containing plasma wherein F atoms both abstract H atoms from and adhere to the surface. The vacuum ultraviolet (VUV) radiation these plasmas produce affect surface properties by reactions such as cross-linking, bond scission and removal of molecular group (e.g., CH_3). In this talk, the consequences of VUV radiation during low-pressure plasma fluorination of PP will be discussed with results from a computational investigation. The capacitively coupled discharge is sustained in He/F_2 mixtures. The reactor is patterned after industrial plasma sources for polymer fluorination. Plasma and surface processes on the moving web were simulated using a 2-dimensional plasma hydrodynamics and surface chemistry model. To properly address radiation trapping, a Monte Carlo radiation transport module is used to generate the photon fluxes incident on the PP film. Assessment of the roles of various photon activated processes in the fluorination process will be made.

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