

Effect of UV/Ozone Treatment on the Adhesion Strength of Polymeric Systems

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Abstract : This study investigates the impact of UV/ozone treatment on the adhesion of ethylene propylene diene methylene (EPDM) rubber, polyvinyl chloride (PVC), and acrylonitrile butadiene styrene (ABS) materials. The experimental tests consist of contact angle measurements, standardized adhesion tests, and spectroscopic and microscopic observations. Also, commonly-used surface free energy models were applied to characterize the wettability of the materials. Preliminary results show that the treatment enhances the wettability of the examined polymers. Also, it considerably improved the adhesion strength of PVC and ABS and shifted their failure modes from adhesive to cohesive, without a significant effect on EPDM. Spectroscopic characterization showed significant oxidation-induced changes in the chemical structures of treated PVC and ABS surfaces. Also, new morphological changes (microcracks, micro-holes, and wrinkles) were observed on these two materials using the SEM. These chemical and morphological changes on treated PVC and ABS promote more reactivity and mechanical interlocking with the adhesive, which explains the improvement in their adhesion strength. After characterizing the adhesion strength of the systems, accelerated ageing tests in controlled environment chambers will be conducted to determine the effect of temperature, moisture, and UV radiation on the performance of the polymeric bonded joints.

Keywords : accelerated tests, adhesion strength, ageing of polymers, UV/ozone treatment

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