

Analysis of Photo - degradation Behavior of Poly Vinyl Chloride Based Products

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Polymers are organic materials composed of large molecules and made of many repeating units. Polymers are widely used in industrial applications today. Polyvinyl chloride (PVC) is a type of thermoplastic which is used in various industries all over the world today. It exhibits the highest sensitivity towards UV radiation when exposed to natural weathering. PVC material deteriorates its properties with time under UV environment. The effect of UV rays on the behaviour of PVC is methodically investigated to obtain a better understanding and control the degradation process especially in the outdoor applications. The objective of this research is to analyse the photodegradation of PVC based products by varying the UV exposure time.

Commercially available 63 mm uPVC pipes were selected for this analysis. Initially, original tensile strength, percentage elongation, hardness and water absorption properties were measured. After that, the prepared samples were subjected to the UV exposure test under the standard conditions. Seven set of samples were removed from the UV chamber at different time intervals (after 24 hours, 48 hours, 72 hours, 96 hours, 120 hours, 144 hours and 168 hours). Tensile strength, percentage elongation, hardness, water absorption properties and visual inspection tests were performed after the UV treatment. Obtained properties were compared with the properties of original (reference) set of samples. Experiment results showed that gradual slightly reduction of tensile strength, percentage elongation and hardness of samples with increase of UV exposed time. There were no significant color changes observed after the UV exposure test for all samples. 168 hours UV treated samples showed the maximum water absorption (0.03%). Original samples showed the hardness of 81.6 Shore D. Percent hardness property retention after 168 hours exposure to UV was 97.2%. Percent property retention for tensile strength and percentage elongation after 168 hours exposure to UV showed as 97% and 96.2% respectively. According to the experimental results, it can be concluded that the tested samples did not show significant property variation after the photodegradation. Therefore, these products are in safe condition to use for required applications.

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