

## **PREDICTING THE IN-SERVICE PERFORMANCE USING THE NIST SPHERE**

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### **Abstract**

Selecting a polymeric material for an application exposed to outdoor weathering is a challenging task. The proper selection requires knowledge of the behavior of the material, which is a complex mixture involving the integration of rheology, reliability based methodology, analytical chemistry, mechanical engineering, statistics, standards development, and economics. Starting from this simple issue the current methods, their consequences, development and implementation of new methods are examined. The research discussed here involves a precisely controlled temperature, humidity, Ultra-Violet radiation, and applied strain device to generate controlled exposure and characterization of the changes due to exposure in model elastomers and coatings. This custom SPHERE device (simulated photo degradation due to high energy radiant exposure, a device that generates >25 "suns" of Ultra-Violet radiation). Additional verification is provided by long term monitored outdoor exposure and equivalent mechanical characterization. The chemical changes related to aging are monitored through changes in the complex modulus. Consideration of the Mullins effect and movement during curing will be examined.