

## **The Stress Corrosion Experiments on an E-Glass/Epoxy Unidirectional Composite**

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### **Abstract**

A series of stress corrosion experiments were performed on a pultruded E-glass/epoxy composite system commonly used in high voltage composite insulators. The tests were performed in nitric acid solutions (pH 1.2) using constant  $K_I$  specimens specifically designed for stress corrosion testing of unidirectional fiber-polymer matrix composites. The effect that the magnitude of the applied loads had on the stress corrosion fracture process was investigated. The process was monitored using acoustic emission (AE) techniques. It was found that when the specimens were subjected to static loads (ranging from 71.2 to 124.6 N) in the presence of nitric acid planar cracks formed and propagated perpendicular to the fiber direction without generating a significant degree of fiber debonding or pullout. In addition, for various stress intensity factors at the crack tip both the normal and log-normal distribution functions were used to model the peak amplitude data generated by stress corrosion induced fiber fracture. Both the AE data and mechanical compliance results clearly indicated that the specimens used in this project provided consistent constant  $K_I$  conditions over the entire range of loads considered. The results from the tests performed in this project clearly demonstrate that the constant  $K_I$  stress corrosion experiments are simple and informative evaluation methods for monitoring stress corrosion cracking in unidirectional composites.