World Academy of Science, Engineering and Technology
International Journal of Materials and Metallurgical Engineering
Vol:9, No:01, 2015

Durability Study of Pultruded CFRP Plates under Sustained Bending in Distilled Water and Seawater Immersions: Effects on the Visco-Elastic Properties

Authors : Innocent Kafodya, Guijun Xian

Abstract : This paper presents effects of distilled water, seawater and sustained bending strains of 30% and 50% ultimate strain at room temperature, on the durability of unidirectional pultruded carbon fiber reinforced polymer (CFRP) plates. In this study, dynamic mechanical analyzer (DMA) was used to investigate the synergic effects of the immersions and bending strains on the visco-elastic properties of (CFRP) such as storage modulus, tan delta and glass transition temperature. The study reveals that the storage modulus and glass transition temperature increase while tan delta peak decreases in the initial stage of both immersions due to the progression of curing. The storage modulus and Tg subsequently decrease and tan delta increases due to the matrix plasticization. The blister induced damages in the unstrained seawater samples enhance water uptake and cause more serious degradation of Tg and storage modulus than in water immersion. Increasing sustained bending decreases Tg and storage modulus in a long run for both immersions due to resin matrix cracking and debonding. The combined effects of immersions and strains are not clearly reflected due to the statistical effects of DMA sample sizes and competing processes of molecular reorientation and postcuring.

Keywords : pultruded CFRP plate, bending strain, glass transition temperature, storage modulus, tan delta
Conference Title : ICCM 2015 : International Conference on Composite Materials
Conference Location : Paris, France
Conference Dates : January 23-24, 2015