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**Comparative effects of humid tropical weathering and artificial ageing on a model
composite properties from nano- to macro-scale**

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Abstract

The effects of humid tropical conditions and artificial ageing tests on a UD glass-fibre/epoxy composite are compared at different scales. A modified network of 500 nm width around each fibre is identified by AFM force measurements. The evolution of this interphase is correlated to the composite embrittlement observed in transverse bending tests during ageing. DSC and DMA show up the matrix plasticization under tropical conditions and hygrothermal ageing. Chain scissions are also involved under artificial and natural UV exposure on surface layers and photoproducts are identified by FTIR analysis. The effects of artificial and natural hygrothermal conditions are emphasized inside interphases. The interfacial areas situated close to the composite surface are highly degraded by UV radiation. Cracks can then be initiated in these areas during bending tests. Finally, AFM force measurements highlight synergistic effects during natural weathering due to the combined effects of UV radiation and hygrothermal conditions.

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