

## **HYGROTHERMAL DURABILITY OF VACUUM INFUSED GFRP COMPOSITES PRODUCED WITH POLYESTER AND VINYL ESTER RESINS**

Tarikul HASAN<sup>1a</sup>, João CORREIA<sup>1b</sup>, Mário GARRIDO<sup>1c</sup>, Susana CABRAL-FONSECA<sup>2</sup>,  
Marco JORGE<sup>3a</sup>, José SENA-CRUZ<sup>3b</sup>

<sup>1</sup> Instituto Superior Técnico, Universidade de Lisboa, CERIS, Portugal  
email : <sup>a</sup> tarikul.hasan@tecnico.ulisboa.pt, <sup>b</sup> joao.ramoa.correia@tecnico.ulisboa.pt,  
<sup>c</sup> mario.garrido@tecnico.ulisboa.pt

<sup>2</sup> National Laboratory for Civil Engineering, Portugal  
email: sbravo@lnec.pt

<sup>3</sup> University of Minho, ISISE/IB-S, Portugal  
email : <sup>a</sup> jose.sena-cruz@civil.uminho.pt, <sup>b</sup> marco@civil.uminho.pt

### **ABSTRACT**

This paper presents the results of an ongoing study on the hygrothermal durability of relatively thick (6.5 mm) vacuum infused glass fibre reinforced polymer (GFRP) composites produced with isophthalic polyester (UP) and vinyl ester (VE) resins. The materials were immersed in water at 20 °C, 40 °C and 60 °C for periods of 3, 6, 12 and 24 months (additional results will be obtained up to 240 months). Mass uptake was measured at predefined intervals, and Fickian-based models were fitted to the data. After each ageing period, the impact of hygrothermal ageing was assessed by thermomechanical (dynamic mechanical analysis) and mechanical (tensile, compressive, and in-plane shear) tests. Arrhenius-type models were then developed, using the obtained mechanical properties, and 50-year predictions were derived and compared to the moisture conversion factor provided in CEN/TS 19101:2022.

### **KEYWORDS**

Glass fibre reinforced polymer; vacuum infusion; durability; hygrothermal ageing; thermomechanical and mechanical properties; modelling.