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Creep Behavior of Basalt Fiber-Metal Laminate Composites

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Abstract

In this paper, the creep behavior of newly basalt fiber metal laminates (BFML) is studied experimentally. For this purpose, standard BFML specimens made by various lay ups of basalt fiber/epoxy laminates with steel and/or aluminum sheets are tested. The failure time, the initial strain and strain rate for all the specimens are evaluated and compared together and also compared with the plain aluminum sheets. The tests are performed at two different temperatures above the glass transition temperature of the epoxy resin to study the effect of temperature on creep behavior. According to the results obtained, adding basalt fiber-reinforced layer considerably affected both the initial strain and the failure time. The fracture surfaces of the specimens are also studied to investigate the failure mechanisms of the BFML composites in creep. The fiber breakage is observed along with delamination and metal rupture. Moreover, for comparison purposes between basalt and glass fibers, the creep behavior of basalt/epoxy and glass/epoxy composites is studied through tensile testing at high temperature. No creep rupture failures are observed in short-term (less than 10000 seconds) high temperature (T= 200 °C) tensile creep tests at loads up to 15% of ultimate tensile strength (UTS). It is also found that the creep resistance of basalt fiber reinforced epoxy (BFRE) is higher than that of glass fiber reinforced epoxy (GFRE).

Key words: A. Polymer matrix composites, A. Hybrid, B. Creep, Basalt fiber

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