

Micro-mechanical testing of magnesium based composites reinforced by carbon fibers manufactured by friction stir processing

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Short C fibres–Mg matrix (AZ91D) composites have been produced by friction stir processing sandwiches made of a layer of C fabric stacked between two sheets of Mg alloy. The process parameters have been optimized to ensure a good fiber distribution. 3D X-ray tomography reveals that the fibers orient like onion rings. Thermal treatments have allowed to modify the flow stress level of the matrix material. Tensile testing inside the scanning electron microscope have revealed the decohesion at the fiber/matrix interface if the fibers are preferentially oriented perpendicularly to the loading direction. Modelling allows to estimate the stress needed to initiate this decohesion is about 250 MPa, i.e. appearing early in heat treated samples. To compare with different loading conditions, micro-compression and instrumented micro-indentation testing have also been performed. The consequence of the loading path on the decohesion is discussed.