Analysis of composition and microstructural uniformity of hybrid glass/carbon fibre composites

In hybrid fibre composites, the intermixing of the two types of fibres imposes challenges to obtain materials with a well-defined and uniform microstructure. In the present paper, the composition and the microstructural uniformity of hybrid glass/carbon fibre composites mixed at the fibre bundle level are investigated. The different levels of compositions in the composites are defined and experimentally determined. The composite volume fractions are determined using an image analysis based procedure. The global fibre volume fractions are determined using a gravimetrical based method. The local fibre volume fractions are determined using volumetric calculations. A model is presented to predict the interrelation of volume fractions in hybrid fibre composites. The microstructural uniformity of the composites is analysed by the determined variation in composite volume fractions. Two analytical methods, a standard deviation based method and a fast Fourier transform method, are used to quantify the difference in microstructural uniformity between composites, and to detect and quantify any repeating pattern in the composite microstructure.

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