University of BRISTOL
Bristol Composites Institute (ACCIS)

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Final report: Intermingled Fibre Composites

A gas-flow-assisted process was developed to spread and co-mingle fibres that was able to produce hybridisation of glass and carbon composites [1]. A method of quantifying the degree of hybridisation was developed and applied to characterising the composites, Fig. 1 [2]. The manufacturing process resulted in slight degradation of the fibres and a broadening of the fibre alignment distribution [3]. Non-constrained annealing of carbon fibre/PA-12 also broadened the fibre distribution, producing wavy fibre composites. Both methods gave a stepwise and more gradual tensile failure mode with the wavy composites having an ultimate failure strain of 2%, significantly higher than 1.6% of the control composite, Fig. 2 [4].

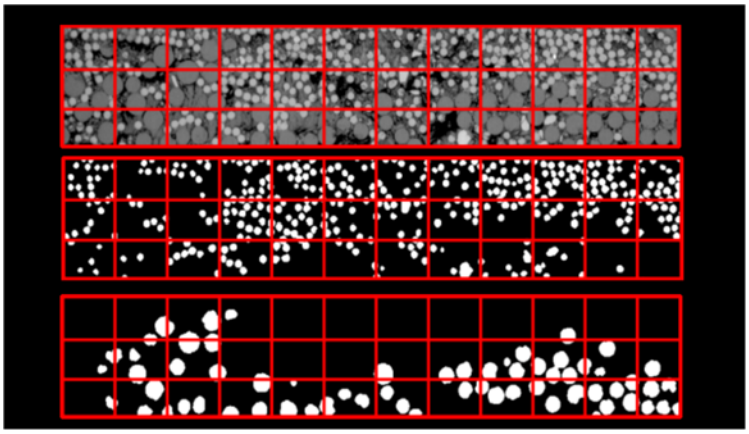

Figure 1: Analysing the degree of hybridisation of glass/carbon composites

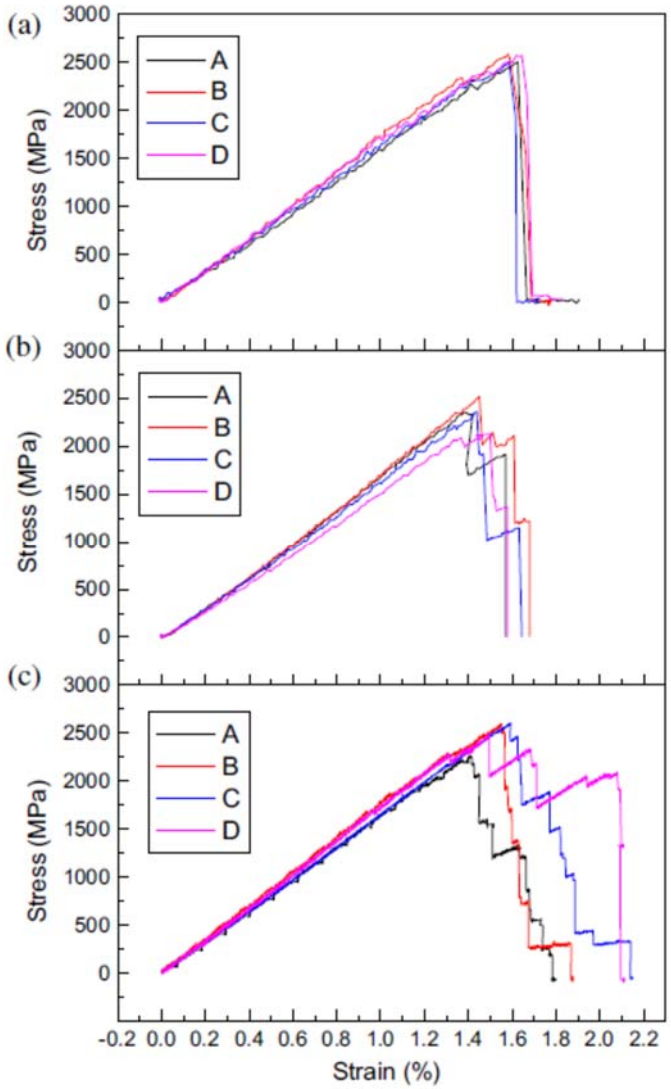

Figure 2: Tensile stress–strain curves of (a) control, (b) gas-textured and (c) non-constrained annealed carbon fibre/PA-12 tapes

1. Diao H, Bismarck A, Robinson P, Wisnom MR. Pseudo-ductile behaviour of unidirectional fibre reinforced polyamide-12 composite by intra-tow hybridization. ECCM 15th European Conference on Composite Materials, Venice, Italy 24-28 June 2012.
2. Diao H, Bismarck A, Robinson P, Wisnom MR. Production of continuous intermingled cf/gf hybrid composite via fibre tow spreading technology. 16th European Conference on Composite Materials (ECCM 16), Seville, Spain, 22-26 June 2014.
3. Diao H, Robinson P, Wisnom MR, Bismarck A. The effect of gas texturing technology on the tensile behaviour of unidirectional (UD) carbon fibre (CF) reinforced polyamide-12 (PA-12) composite. The 19th International Conference on Composite Materials (ICCM19), Montreal, Canada, 28 July-2 August 2013.
4. Diao H, Robinson P, Wisnom MR, Bismarck A. Unidirectional carbon fibre reinforced polyamide-12 composites with enhanced strain to tensile failure by introducing fibre waviness. Composites Part A: Applied Science and Manufacturing. 2016, 87, 186-193. http://dx.doi.org/10.1016/j.compositesa.2016.04.025