

ROC STUDY ON MANUFACTURING AND MECHANICAL PROPERTIES OF NANOCOMPOSITE LAMINATES

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ABSTRACT

The work aims to manufacture nano-composite laminates first. The prepreg form of AS-4 Graphite/PEEK laminae was used to make APC-2 composite laminate of 2 mm thick with two lay-ups of cross-ply and quasi-isotropic 16 plies by hot press via the modified diaphragm curing process. The nano-particles SiO₂ with the average diameter of 15±5 nm were uniformly spreaded in the specific interfaces of laminate according the stacking sequence by sol-gel method. The total amount of nano-particles was measured about 1-3% by wt. Second, the tensile testing was conducted to see the improvement of mechanical properties in laminates with and without nano-particles. It is found that the optimal content of nano-particles is 3% by wt. The ultimate strength increases about 10% and elastic modulus 22% in quasi-isotropic nano-laminates in comparison with APC-2 laminates. Whilst, the improvement of cross-ply nano-laminates is less than that of APC-2 laminates. At elevated temperature (RT, 50, 75, 100, 125, 150°C) the ultimate strength decreases slightly below 75°C; and the elastic modulus reduces slightly below 125°C; however, both properties degrade highly at 150°C (T_g) for two lay-ups generally.

Keywords: Nano-particles, composite, laminate, mechanical properties, elevated temperature, tensile test, strength, elastic modulus.

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