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Effects of the cationic initiator concentration on the electron beam curing of carbon-epoxy composites

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The manufacture of high-performance carbon-epoxy composites cured by high-energy electron beam systems is a promising new technology. The process reduces the time required to cross-link the polymeric matrix compared to conventional thermal curing. In addition, due to the low temperature provided by the method, residual stress in the composite can be reduced a lot. This work describes the effects of cationic initiator (diaryliodonium hexafluoroantimonate) concentration from 1 to 3% on the curing of commercial epoxy resin (high purity and low viscosity diglycidyl ether of bisphenol A) using as radiation source a DC 1500/25 – Job 188 Dynamitron linear accelerator, with 0.5 to 1.5MeV, 0.1 to 25mA and 60 to 120cm scanning electron beam. The complete cure cycle of the resin system cured by electron beam spent 40 min with a total dose of 250 kGy. The glass transition temperature was 167 °C and it refers to the tan δ curve of a DMTA analyser. The cure degree was 96% and it was obtained by a differential scanning calorimetry. The same epoxy resin, but with an anhydride hardener, was cured by thermal process for a period of 16 hours and its glass transition temperature was 125°C considering the tan δ curve of the DMTA.