Study of Electron Beam Curing Process Using Epoxy Resin System

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The competition among industries in the current globalization system has required a systematic cost reduction without affecting the quality of the final product. This fact has encouraged the use of new technologies application on productive process, especially on polymeric composites, to assure the competitiveness. The possibility of producing a new type of carbon fiber reinforced composite by radiation process with excellent thermal and mechanical properties, has been researched since 90's and it can be a potential application in aerospace, marine and automobile industries [1-4].

The polymeric composites cured by thermal process (furnace or autoclave) are an example of long curing cycles, which requires time and energy consumption. Electron beam curing technology allows the process at room temperature and reduces curing time; consequently, it becomes the main difference of this technology over thermal curing process.

The aim of this work was to study electron beam curable epoxy formulation for filament winding process, as well as to investigate the electron beam curing process parameters using a DC 1500/25 - Job 188 Dynamitron model linear accelerator as radiation source, with 0.5 to 1.5 MeV, 0.1 to 25 mA and 60 to 120 cm scanning electron beam. The resin system consists of commercial epoxy resin (diglycidyl ether of bisphenol A – DGEBA) and cationic initiator (diaryliodonium hexafluoantimonate) and the polymerization carried out at room temperature with controlled dose rate. Thermal post cure took part of the process to improve the degree of cure and glass transition temperature (T_g) similar to thermal curable resin properties.

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