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# Interfacial Reactions between Aromatic Polyamide Fibers and Epoxy Matrix

**Authors :** Khodzhaberdi Allaberdiev

**Abstract :** In order to understand the interactions on the interface polyamide fibers and epoxy matrix in fiber- reinforced composites were investigated industrial aramid fibers: armos, svm, terlon using individual epoxy matrix components, epoxies: diglycidyl ether of bisphenol A (DGEBA), three- and diglycidyl derivatives of m, p-amino-, m, p-oxy-, o, m,p-carboxybenzoic acids, the models: curing agent, aniline and the compound, that depict of the structure the primary addition reaction the amine to the epoxy resin, N-di (oxyethylphenoxy) aniline. The chemical structure of the surface of untreated and treated polyamide fibers analyzed using Fourier transform infrared spectroscopy (FTIR). The impregnation of fibers with epoxy matrix components and N-di (oxyethylphenoxy) aniline has been carried out by heating 150˚C (6h). The optimum fiber loading is at 65%.The result a thermal treatment is the covalent bonds formation , derived from a combined of homopolymerization and crosslinking mechanisms in the interfacial region between the epoxy resin and the surface of fibers. The reactivity of epoxy resins on interface in microcomposites (MC) also depends from processing aids treated on surface of fiber and the absorbance moisture. The influences these factors as evidenced by the conversion of epoxy groups values in impregnated with DGEBA of the terlons: industrial, dried (in vacuum) and purified samples: 5.20 %, 4.65% and 14.10%, respectively. The same tendency for svm and armos fibers is observed. The changes in surface composition of these MC were monitored by X-ray photoelectron spectroscopy (XPS). In the case of the purified fibers, functional groups of fibers act as well as a catalyst and curing agent of epoxy resin. It is found that the value of the epoxy groups conversion for reinforced formulations depends on aromatic polyamides nature and decreases in the order: armos >svm> terlon. This difference is due of the structural characteristics of fibers. The interfacial interactions also examined between polyglycidyl esters substituted benzoic acids and polyamide fibers in the MC. It is found that on interfacial interactions these systems influences as well as the structure and the isomerism of epoxides. The IR-spectrum impregnated fibers with aniline showed that the polyamide fibers appreciably with aniline do not react. FTIR results of treated fibers with N-di (oxyethylphenoxy) aniline fibers revealed dramatically changes IR-characteristic of the OH groups of the amino alcohol. These observations indicated hydrogen bondings and covalent interactions between amino alcohol and functional groups of fibers. This result also confirms appearance of the exo peak on Differential Scanning Calorimetry (DSC) curve of the MC. Finally, the theoretical evaluation non-covalent interactions between individual epoxy matrix components and fibers has been performed using the benzanilide and its derivative contaning the benzimidazole moiety as a models of terlon and svm,armos, respectively. Quantum-topological analysis also demonstrated the existence hydrogen bond between amide group of models and epoxy matrix components.All the results indicated that on the interface polyamide fibers and epoxy matrix exist not only covalent, but and non-covalent the interactions during the preparation of MC.

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