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Characteristics of Cure Reaction of Modified DGEBA/MDA Systems

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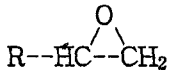
The epoxy resin classified as thermosetting is characterized by the possession of one or more 1,2-epoxy group per molecule.



It is very important in commercial applications because of its good stability against heat or chemicals, electrical properties, and adhesive strength due to polarity induced from hydroxyl(-OH) and ether(-O-) groups. As a result of versatility, epoxy resin has been used as adhesives and matrices for high performance, fibrous composites used in aircraft, automobiles and so on. Easily influenced by ultraviolet, however, aromatic rings of bisphenol-A type epoxy resin are apt to yellowing and chalking and are inherently brittle by impact because of the formation of a three-dimensional crosslinked network during curing. For that reason, Commercial applications of epoxy resin are rarely used without incorporation of some other materials.

In this study, the curing reaction of bisphenol A type epoxy resin systems modified with reactive additives and catalyst was investigated by the thermal analysis using the differential scanning calorimetry (DSC).

To improve its toughness, reactive additive or chain extender such as nitrile compounds, SN(succinonitrile), MN (malononitrile) and GN (glutaronitrile) were introduced and to lower the reaction temperature, HQ was added as a reactive accelerator. The nitrile compound/HQ was added at the ratio of 4:1 in phr.

Chain extension was caused by the formation of imino group (-C(=NH)-O-) and amide group(-C(=O)-NH-) during curing. The effect of adding nitrile compounds could be certified by measuring of Tg (glass transition temperature), impact strength and analyzing the FT-IR spectrum. The lowering of reaction starting temperature was also observed by DSC thermogram.

In this present systems, the kinetic parameters such as overall reaction order, activation energy and pre-exponential factor could be obtained by *n*th order kinetic equation from DSC measurements.