ABSTRACT

Epoxy resins particularly, diglycidyl ether of bisphenol-A (DGEBA) is thermoset and one of the most commonly used matrix resin in structural applications such as laminates and composites. This is primarily due to its fluidity, low shrinkage during cure and ease of processing. The cured resins have good mechanical properties (i.e. ultimate tensile strength, modulus, elongation at break, toughness and fatigue resistance), low moisture absorption and relatively high thermal stability and flame resistance.

The present thesis deals with DGEBA epoxy resin modified with different percentage trimellitic anhydride. The modified resin having free acid anhydride, secondary hydroxyl along with epoxy in one chain, which is cured by different types of hardeners. The different type of functional group having certain advantages for ambient temperature curing with amine hardener, curing with organic titanate for making organic-inorganic polymer hybride. The study of fast curing epoxy with amine hardener, gives low pot life 50% less than standard. The very small quantity of ecofriendly organic titanate (0.5-1.0 wt% on epoxy resin) plays vital role in thermal curing.

In-situ generation of alkoxide particle of TiO₂ and BaCO₃ in cured polymer matrix using tetra n-butyl titatane and barium acetate by thermal curing, these system has certain advantages in electric and electronic applications. The modified epoxy resin are very convient for the loading of higher concentration of multiwall carbon nanotube, as compare to standard epoxy. silicon nano wires/particles are synthesized by thermal plasma and functionalization with 3-aminopropyl trimethoxy siliane. The functionalized silicon nano wires are used for the making composites with DGEBA standard, epoxy and carboxylic acid modified epoxy. The functionalized silicon/particles nano wires are well dispersed in 0.05-0.8 wt% in standard liquid epoxy and carboxylic acid modified epoxy and these cured with triethyl tetra amine hardner. In cured composite gives high thermal resistance and uniform distribution was observed. These composites are very generic and innovative, this can be use in electric application and marine coating, aerospace application for thermal resistance.