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COMPARATIVE STUDY ON EPOXY-BASED NANOCOMPOSITES

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Abstract

Epoxies are usually reinforced using inorganic and organic nanofillers such as graphene, carbon nanotubes (CNT), nano silica, nanoclay (NC), polyimide, cellulose nanofibers, etc. CNTs are considered to be critical nanomaterials in various fields of nano-electronic components, chemical sensors, composite reinforcement materials, and film materials. The superiority of CNT especially is that the addition of even a small amount of CNTs into the composites can enhance their electrical conductivity, thermal, and mechanical properties. Nanoclays have become widely used reinforcing agents for epoxy and other polymer composites among various nanoparticles. This is because of their better mechanical performance, and montmorillonite is the most widely used in materials applications. The flame-retardant, antimicrobial, anti-corrosion and self-healing properties of polymer-clay nanocomposites are known, in addition, they are biocompatible and harmless to the environment. In this study, bisphenol A-type epoxy resin was modified with bio-based acrylated epoxidized soybean oil (AESO) in 90:10 and 85:15 ratios by weight. Hydroxyl functionalized *CNT* (CNT-OH) and montmorillonite-type NC were used as reinforcement in the epoxy matrix. The composites were prepared according to ASTM D 638 standards using the casting technique. Four point probe technique was used for electrical conductivity measurement. For thermal properties, Thermogravimetric analysis (TGA) was applied. The effect of AESO amount, filler type, and filler ratio on mechanical properties (such as tensile strength, e-modulus, and hardness), electrical conductivity, and thermal stability was investigated. Higher mechanical properties were achieved with NC. Increasing the AESO amount in epoxy resin caused a decrease in mechanical properties.

Keywords: epoxy resin, modification, CNT, nanoclay, composite