

SYNTHESIS, CHARACTERIZATION, AND PROPERTIES OF NEW UNSATURATED POLYESTERS RESINS REINFORCED WITH SOME FILLERS (CARBON NANO, NANO TiO₂, TiO₂ AND ZnO) FOR COMPOSITE APPLICATION

MOHAMMED AIL MUTAR¹ & ZAINAB HAMID ABDULLAH ATTAB²

¹Department of Chemical Engineering, College of Engineering, University of AL-Qadisiyah, Iraq

²Department of Chemistry, College of Education, University of Al-Qadisiyah, Iraq

ABSTRACT

The unsaturated polyester resin considered at the present time a significant matrix resin for thermosetting polymer compound. The Major objective of this study was to synthesize and characterize new unsaturated polyester resins for composite applications. Four types of new monomer polyester resins were synthesized, including: phthalic acid mono-(4-carboxy-phenyl) ester (AC1), but-2-enedioic acid mono-2-carboxy-phenyl) ester (AC2), phthalic acid mono-(2-carboxy-phenyl) ester (AC3) and but-2-enedioic acid mono (2-carboxy-phenyl) ester (AC4). These monomers were synthesized from salicylic acid and phthalic anhydride, phthalic anhydride and p-hydroxybenzoic acid, maleic anhydride and p-hydroxy benzoic acid in the presence H₂SO₄ as catalyst. The chemical structures were confirmed by FTIR and ¹HNMR spectroscopy. New unsaturated polyesters were synthesized by the condensation reaction between (ethandiol, triethanol amine and ethylene glycol) and acids (phthalic acid mono-(4-carboxy-phenyl) ester (AC1), phthalic anhydride, phthalic acid mono-(2-carboxy-phenyl) ester)(AC1) with (maleic anhydride and but-2-enedioic acid mono (2-carboxy-phenyl) ester) in presence p-toluene sulphonic acid as catalyst. All of these unsaturated polyesters show good solubility in common organic solvents, such as (DMSO, CH₂Cl₂, THF, DMF, acetone and some non-polar solvents as Benzene and CH₃Cl. Thermal analysis of polyesters by thermo gravimetric analysis (TGA) reveals that these Aromatic polyesters possess thermal stability, differential scanning calorimetry (DSC) were also studied. Unsaturated polyesters supported with some Nano fillers such as carbon Nano, TiO₂ Nano and TiO₂ and Zinc oxide for composite applications. The results showed that the new unsaturated polyesters reinforced fillers (Carbon Nano, Nano TiO₂, TiO₂ and ZnO) composites exhibit high mechanical properties at 20% wt. of loading filler.

KEYWORDS: Unsaturated Polyester Resin, Composite, Nano Fillers, Mechanical Properties