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EDITORIAL

Organic Polymer Materials for Light Emitting Diode Applications

Fayroz Arif Sabah*

Department of Medical Instrumentation Engineering Techniques, College of Medical Techniques, Alfarahidi University, Baghdad, Iraq

ARTICLE INFO

Article history
Received: 27 December 2021
Accepted: 10 January 2022
Published Online: 18 January 2022

There are two common types of polymers (thermoplastics and thermosets), which have been classified by various methods depending on their molecular structures. The bonding of molecular chains is the fundamental physical difference between these two polymer types. The polymer types are named based on their general thermal and processing characteristics, and chemical structure, which in turn significantly influence their polymer properties [1].

Thermoplastics have secondary bonds between molecular chains, low melting points and low tensile strength, and are lower in molecular weight compared to thermosetting plastics. While, thermosetting plastics have primary bonds between molecular chains, held together by strong cross-links, have high melting points and tensile strength, and are high in molecular weight [2,3]. Thermoplastic composites can be reconfigured/repaired unlike thermosetting composites when applying heat and this cycle can be frequent. In terms of impact resistance, thermoplastic polymers exhibit good elastic-plastic behaviour and thus have better impact performance than their thermosetting counterparts [4,5]. All thermoplastic materials exist in any of the three polymer phases depending on the changes in temperature used [1]. Thermosetting polymers are based on epoxies, polyesters, polyimides and phenolics [6], and mostly exist only in the initial two phases [1].

Polyvinyl alcohol (PVA) is a hydrophilic polymer [7] that is valuable in material studies and practical applications by reason of its physical properties. PVA is a linear polymer with formula $[CH_2CH(OH)]_n$ [8]. PVA hydrogel is characterized by a noncorrosive nature, easy synthesis and amenability, high transmittance and good thermal stability over a wide temperature range, and typical matrix for optoelectronic applications [7].

**Corresponding Author:*
Fayroz Arif Sabah,
Department of Medical Instrumentation Engineering Techniques, College of Medical Techniques, Alfarahidi University, Baghdad, Iraq
Email: fayroz.arif@gmail.com

DOI: https://doi.org/10.30564/opmr.v3i2.4348

PVA is applied in the production of catalyst pellets, cork compositions, binders in fibers, pigments, ceramics, plastics, cement, etc. In addition, PVA has garnered interest in biomedical applications. However, PVA is unstable when subjected to heat treatment mostly near melting point. This instability due to the inherent presence of hydroxyl groups makes its melting point close to the glass transition temperature [8].

In recent time, polymers and semiconductors (with built in nanocomposite structures) have attracted attention in the field of material science due to their ability to modify the physicochemical properties of the materials. Nano-sized particles improve their optoelectronic properties, by facilitating the coupling of mechanical and optoelectronic properties. Polymer matrix composite enhances the growth, long shelf life, and stability of the nanoparticles in addition to inhibiting their aggregation. Factors that directly affect the properties of particulate polymer nanostructure include particle concentration, size, shape, the method of dispersing particles, and their interaction with the polymer matrix [7].

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