Nanocomposites and nanomaterials

Polymer nanocomposites for optical applications

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It is well-known that the doped polymer films are widely used in various optical applications due to their physico-chemical characteristics. The optical band gap energy (E_g) is one of such characteristics. It allows to improve electrical parameters of various optical devices. Typically, the E_g values of doped polymer materials are in the range from 2 to 4 eV, approximately [1].

In the present work, new wide-bandgap nanocomposite polymer films based on epoxy polymer and natural pigment 3,5,7,3',4'–pentahydroxyflavone (quercetin) as dopant have been investigated.

Uv-vis transmittance spectra showed that doped nanocomposite polymer films exhibit optical transparency about 80% up to 450 nm. Below this optical region, the transparency of the obtained films decreases due to self-absorption of quercetin molecules. The E_g values for nanocomposite films were calculated as it was described in [2].

It was determined that the E_g values of the polymer nanocomposite films depend on the dopant concentration, and they are in the range from 3.75 to 4.4 eV, approximately. When the concentration of dopant exceeds 20%, a sharp increase of E_g values takes place. These data can be reasonably described using the percolation theory.

The obtained data allow to conclude that the investigated nanocomposite films can be utilized as wide-bandgap polymer semiconductors.

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