

Study of the Interface Interactions of Conjugated Polymer- Metal Oxide Nanoparticle Composite

Tsegaye Belege Atisme*¹, Chin-Yang Yu¹, Eric Nestor Tseng¹, Yi-Chi Chen¹, Pei-Kai Shu¹, Shih-Yun Chen¹

¹Department of Materials Science and Engineering, National Taiwan University of Science and Technology, Taipei, Taiwan

Abstract

This study presents the important interaction and the property of a new composite. CeO₂ nanoparticles prepared by co-precipitation method were dispersed in conjugated polymer blends, which were obtained, via Suzuki cross-linking. Composite films were prepared by drop casting a homogeneous solution of random polymer and CeO₂ nanocrystals onto silicon wafer substrates. The dispersion of the nanoparticles in the polymer matrix was studied using TEM. The dispersion of CeO₂ nanoparticles on the polymer matrix is dependent on the concentration of CeO₂ nanoparticles in the hybrid. This difference in dispersion has effect on the property of hybrid. The photoinduced charge transfer and recombination processes at the interface between the two components were studied by steady-state optical spectroscopy and X-ray Absorption spectroscopy experiments. The resultant optoelectronic properties are investigated. A significant fluorescence quenching and red shifting of peak of the polymer occurred in CeO₂/polymer hybrid and higher photoactivity of as prepared blends compared to the single components was observed and explained. Finally the magnetic property of the individual components and the hybrid was analyzed using VSM which shows that the ferromagnetic property both components and the effect on ferromagnetism after hybridization is explained.

Keywords – Dispersion, charge transfer, fluorescence, quenching, red shifting.