Hindawi Publishing Corporation
Journal of Nanotechnology
Volume 2011, Article ID 870829, 2 pages
doi:10.1155/2011/870829

Editorial
Nanocomposites

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Received 1 March 2012; Accepted 1 March 2012

Nanocomposites have shown unique advantages in achieving properties to find tremendous potential applications in science and technology. Due to their diverse structures, nanocomposites exhibit a wide variety of tunable properties to realize the prominent and desirable performances in mechanical, electrical, thermal, optical, electrochemical, and catalytic fields. The properties of nanocomposite materials depend not only on the properties of the building components, but also on their morphologies and interfacial characteristics. There is also the possibility of producing improved multifunctionalities and/or new properties due to the coupling between the two components, which may not be found for each component at a pure state. In this special issue on nanocomposites, we have already received the relevant nanocomposites' work of broad field from worldwide scientists. The published works are briefly addressed as follows.

The first paper of this issue is by Japanese research group about phthalocyanines/fullerene organic photovoltaic cells. Effects of Au nanoparticle addition to a hole transfer layer were investigated, and power conversion efficiencies of the photovoltaic cells were improved after blending the Au nanoparticle into PEDOT:PSS. The second paper by Netherlandish scientists reports that N-doped SnO_2 nanoparticles photocatalyze directly the polymerization of the C=C bonds of (meth)acrylates under visible light illumination. The Egyptian professors in the third paper show a new chemically synthesized magnetic nanoparticle of Fe_3O_4 and core-shell Fe_3O_4@Au. A comparative study between the photocatalytic activity between Fe_3O_4 and core-shell Au-Fe_3O_4 nanoparticles has been exploring the effect of UV and sun light on the photodegradation of chloridazon. The fourth paper presents the Mexican scientist work regarding the syntheses of monolithic mesoporous silica glasses. The presence of Cu^{2+} and Fe^{3+} cations during the synthesis of sol-gel precursors leads to different morphologies and pore sizes. Meanwhile, the relationship of materials structure and properties has been analyzed.

The USA research group in the fifth paper states that inorganic nanoparticles doped with optically active rare-earth ions and coated with organic ligands were synthesized in order to create fluorescent polymethyl methacrylate nanocomposites. The sixth and seventh papers from the Indian group present development of deagglomeration and uniform dispersion of nanoparticles in nanocomposites. Russian research groups address coagulation technique applied for preparation of multiwall carbon nanotube (MWNT-) containing polystyrene composite materials with different MWNT loading (0.5–10 wt.%) and synthesis and investigation of nanoparticles role in structuring of homogenous nanocomposite based on ZnO nanoparticles in UV-curable monomers mixture in papers eight and nine, respectively.

The British professors in the tenth paper investigate electrochemical double-layer capacitors including two alternative types of carbon-based fibrous electrodes, a carbon fibre woven fabric (CWF) and a multiwall carbon nanotube (CNT) electrode, as well as hybrid CWF-CNT electrodes.

Another Indian group in the eleventh state that polyacrylonitrile (PAN)/montmorillonite (MMT) clay nanocomposite was prepared in a microwave oven. They used a transition metal Co(III) complex taking ammonium persulfate as initiator with a motive of converting hydrophobic PAN into hydrophilic nanocomposite material by the inclusion of MMT to the virgin polymer. The Malaysian researchers present the nanocomposites systems. It is firstly prepared via intercalation technique with different organophilic montmorillonite in the twelfth. Meanwhile, they also report the crystallization and oxygen barrier properties of high density-polyethylene (HDPE)/ethylene propylene diene monomer (EPDM) matrix and HDPE/EPDM modified by electron beam irradiation technique in the thirteenth paper. The final paper by Chinese scientist reports a new ultrafast conduction mechanism in insulating polymer nanocomposites. A brand new phenomenon, namely, electrical conduction via solution-like ultrafast space charge pulses, is shown for the first time to occur in insulating polymer nanocomposites and its characteristics correlated with the electromechanical properties of nanostructured materials.

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