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*Editorial*

# Design, Synthesis, and Characterization of Hybrid Materials

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For last decade, the nanoparadigm has dominated materials science and technology. Nanotechnology has ushered in a paradigm shift in science, industry, and our daily lives. However, high-tech industries continuously need to be fed innovations in materials and components. New materials and components required in pioneering 21st century industries can be revealed through "hybrid" technology. Many researchers believe that this new "hybrid" paradigm will create great opportunities and changes in science, industry, and our daily lives, as the nanoparadigm greatly plays a role in the materials innovation and developments. This interest resulted in an agreement to organize a new International Symposium on Hybrid Materials and Processing (HyMaP) in 2008. And The 3rd International Symposium on Hybrid Materials and Processing (HyMaP 2014) was held at the Haeundae Grand Hotel in Busan, Korea, from November 10, 2014.

The papers in this special issue were selected among the papers submitted at HyMaP 2014. This special issue provides a wide spectrum of new information on hybrid materials and processing. The topics focused on the hybrid function, that is, functionally hybridized materials where new specific characteristics are simultaneously realized, along with the typical function of those materials.

The special issue contains numerous papers focused on the functional hybrid materials. More specifically, topics of hybrid materials for electronic devices, membrane for hydrogen production, laser surface treatment on hybrid materials, and mechanical properties of hybrid materials are discussed in this special issue.

In the paper entitled "Conductivity and Dielectric Studies of Lithium Trifluoromethanesulfonate Doped Polyethylene Oxide-Graphene Oxide Blend Based Electrolytes," A. A. Azli et al. study the conductivity and dielectric properties of polymer/grapheme oxide hybrid materials for electrolytes. In plasticized system, the conductivity has been enhanced as compared to the conductivity in salted system.

In a paper entitled "Influence of Tensile Speeds on the Failure Loads of the DP590 Spot Weld under Various Combined Loading Conditions," J. H. Song and H. Huh investigate the evaluation of the dynamic failure load of the spot weld under combined axial and shear loading conditions. They show that the failure contour is expanded with increasing loading speeds and failure loads show similar dynamic sensitivity with respect to the loading angles.

In a paper entitled "Characteristics of Nanophase WC and WC-3 wt% (Ni, Co, and Fe) Alloys Using a Rapid Sintering Process for the Application of Friction Stir Processing Tools," D. Kim et al. introduce microstructures and mechanical characteristics of tungsten carbide (WD) based alloys fabricated using a spark plasma sintering (SPS) method for the application of friction stir processing tools. The density of the sintering bodies was about 99% and the average grain size was in the range from 0.26 to 0.41 $\mu$m. The sintered bodies were obtained without almost grain growth during sintering.

In a paper entitled "Optimization and Static Stress Analysis of Hybrid Fiber Reinforced Composite Leaf Spring," L. M. A. Ismaeel investigates a monofiber reinforced composite leaf spring, which is proposed as an alternative to the typical steel one as it is characterized by high strength to weight ratio. Fibers are the most predominant and controlling element on the bending stiffness of the structure. And E-glass fiber in the hybrid composites does not exhibit a regular behavior making it difficult to accurately predict hybrid composite spring performance, response, and stresses, while boron is the opposite; thus it is advisable to adopt it in such applications with various matrices.

In a paper entitled "The Polymerization of MMA and ST to Prepare Material with Gradient Refractive Index in Electric Field," Y. Huang et al. consider light scattering material with gradient refractive index was prepared under the electrical field by taking methyl methacrylate (MMA) monomer as the matrix with the addition of a little preheated styrene (ST) and peroxidation benzoin formyl (BPO). They conclude that electrical field has a significant effect on polymerization.

In a paper entitled "Improvement of Surface Properties of Inconel718 by HVOF Coating with WC-Metal Powder and by Laser Heat Treatment of the Coating," H. G. Chun et al. investigate when high-velocity oxygen-fuel (HVOF) thermal-spray coating with WC-metal powder was carried out by using optimal coating process on an Inconel718 surface. For the improvement of surface properties and durability of materials, HVOF coating of WC-metal powder on the surface and faster heat-treated coating were strongly recommended.

In a paper entitled "Fabrication of a Microtubular $La_{0.6}Sr_{0.4}Ti_{0.2}Fe_{0.8}O_{3-\delta}$ Membrane by Electrophoretic Deposition for Hydrogen Production," K.-J. Lee et al. prepare microtubular type $La_{0.6}Sr_{0.4}Ti_{0.2}Fe_{0.8}O_{3-\delta}$ (LSTF) by electrophoretic deposition (EPD). The oxygen permeation and hydrogen production behavior of the membranes were investigated under various conditions. They suggest that hydrogen production via water splitting using these tubular LSTF membranes is possible.

In a paper entitled "Preparation and Properties of OMMT /PU Composites," C. Yufei et al. introduce prepolymer of polyurethane (PU) by toluene diisocyanate (TDI) and polyether diol through polymerization, organically modified montmorillonite (OMMT) gained by montmorillonite (MMT) that was modified by octadecyl trimethyl ammonium chloride (OTAC), and the OMMT was used as intercalator; alcohol-based OMMT/PU adhesive was synthesized. The morphology of OMMT filler was clear and OMMT dispersed uniformly in OMMT/PU adhesive, and the size of OMMT was nanoscale. The uniform mixing of OMMT layer and PU matrix could achieve on nanoscale, so mechanical properties of OMMT/PU were improved, and water absorption quantity decreased.

The paper entitled "Feasibility Studies on Underwater Laser Surface Hardening Process" by B. Jin et al. experimentally characterizes laser surface hardening of tool steel in both water and air. As the hardened depth depends on the thermal conductivity of the material, the surface temperature and the penetration depth have been varied by underwater laser processing. On the view point of hardness, harder layer has been obtained at underwater hardening that is supposed to be caused by faster cooling rate due to accelerated heat dissipation along water layer.

In a paper entitled "Kinetic Studies of Atom Transfer Radical Polymerisations of Styrene and Chloromethylstyrene with Poly(3-hexyl thiophene) Macroinitiator," N. Rattanathamwat et al. investigate the kinetics of ATRP as a function of monomers to the macroinitiator molar ratio. They found that all of the three types of ATRP systems led to first-order kinetics with respect to monomers.

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