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Editorial

Advanced Hybrid Functional Materials for Energy Applications

Iftikhar Ali Sahito,[1] **Chengyu Hong**,[2] **and Sung Hoon Jeong**[3]

[1]*Department of Textile Engineering, Mehran University of Engineering and Technology, Jamshoro 76060, Pakistan*
[2]*Department of Civil Engineering, Shanghai University, Shanghai 200444, China*
[3]*Department Organic and Nano Engineering, Hanyang University, Seoul, Republic of Korea*

Correspondence should be addressed to Iftikhar Ali Sahito; iftikhar.sahito@faculty.muet.edu.pk

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This special issue is intended to present and discuss recent challenges and technological advancement in development and recent research trends for the use of functional nanomaterials and their application in energy harvesting and energy storage devices and to understand the science of the recently developed functional nanomaterials for energy applications. This special issue gives an insight into the functional materials having potential application in the energy harvesting and storage including the materials used for the recently developed perovskite solar cells. A good number of papers were submitted, and after a thorough peer review process, six papers were selected to be included in this special issue.

The included papers cover important applications of nanomaterials for energy application, including in quantum dot solar cells, perovskite solar cells, optoelectrical properties of fullerene derivatives, phase change behavior of carbon derivatives, stabilization of electrospun nanofiber mats, and self-ordered void formation in silicon dioxide. We believe that the original work published in this special issue highlights the contemporary topics in research related to functional nanomaterials in energy applications and will familiarize readers to the latest advances in the field.

The paper by K. Mukai and Y. Ishida presents a significant improvement in the characteristics of organic solar cells on Si substrates using quantum dot (QD) superlattices prepared by sedimentation. They discovered that the PbS QD grains grew into a large superlattice when the deposition proceeded for a long period of time. They also revealed that when the deposition is slow, the short-circuit current density of the solar cell doubles compared with the rapid deposition case.

The paper by N. Radychev et al. presents an investigation of two donor-acceptor copolymers based in the view of photovoltaic application. They revealed that the resulting copolymers exhibit strong absorption in the visible region with a similar band gap of about 2.2 eV and applying an optimization procedure, a power conversion efficiency of 4.6% is shown to have been achieved for the PC71BM solar cells.

The paper by T.-P. Teng et al. presents a novel carbon-based nanofluids (CBNFs) with the minimized carbon materials (MCMs), prepared using a graphite-powder-based heating and cooling processing method (GP-HCPM), with improved stability. Their results revealed that the CBNFs tend to increase the thermal conductivity k, viscosity, and density values but reduce the specific heat values of the samples, compared with water.

The paper by L. Sabantina et al. presents first tests of stabilizing PAN/gelatin nanofibers, depicting the impact of different stabilization temperatures and heating rates on the chemical properties as well as the morphologies of the resulting nanofiber mats. They discovered that like the stabilization of pure PAN, a stabilization temperature of 280°C seems suitable. Also, compared to stabilization of pure PAN nanofiber mats, approximately double heating rates can be used for PAN/gelatin blends without creating undesired conglutinations.

The paper by J. Lim et al. presents $CH_3NH_3PbI_3$ perovskite-sensitized solid state solar cells with the use of different polymer hole transport materials and showed that the device with a spiro-OMeTAD-based hole transport layer shows the highest efficiency of 6.9%. Interestingly, the

PTB7 polymer, which is considered an electron donor material, showed dominant hole transport behaviors in the perovskite solar cell.

The paper by B. Pivac et al. presents the annealing behavior of very thin SiO_2/Ge multilayers deposited on Si substrate by e-gun deposition. They showed that after annealing at 800°C, in inert atmosphere, Ge is completely out-diffused from the SiO_2 matrix leaving small (about 3 nm) spherical voids embedded in the SiO_2 matrix. These voids are formed at distances governed by the preexisting multilayer structure (in vertical direction) and self-organization (in horizontal direction).

Conflicts of Interest

We, the guest editorial team of the special issue, declare that we do not have any conflict of interest or private agreements with companies.

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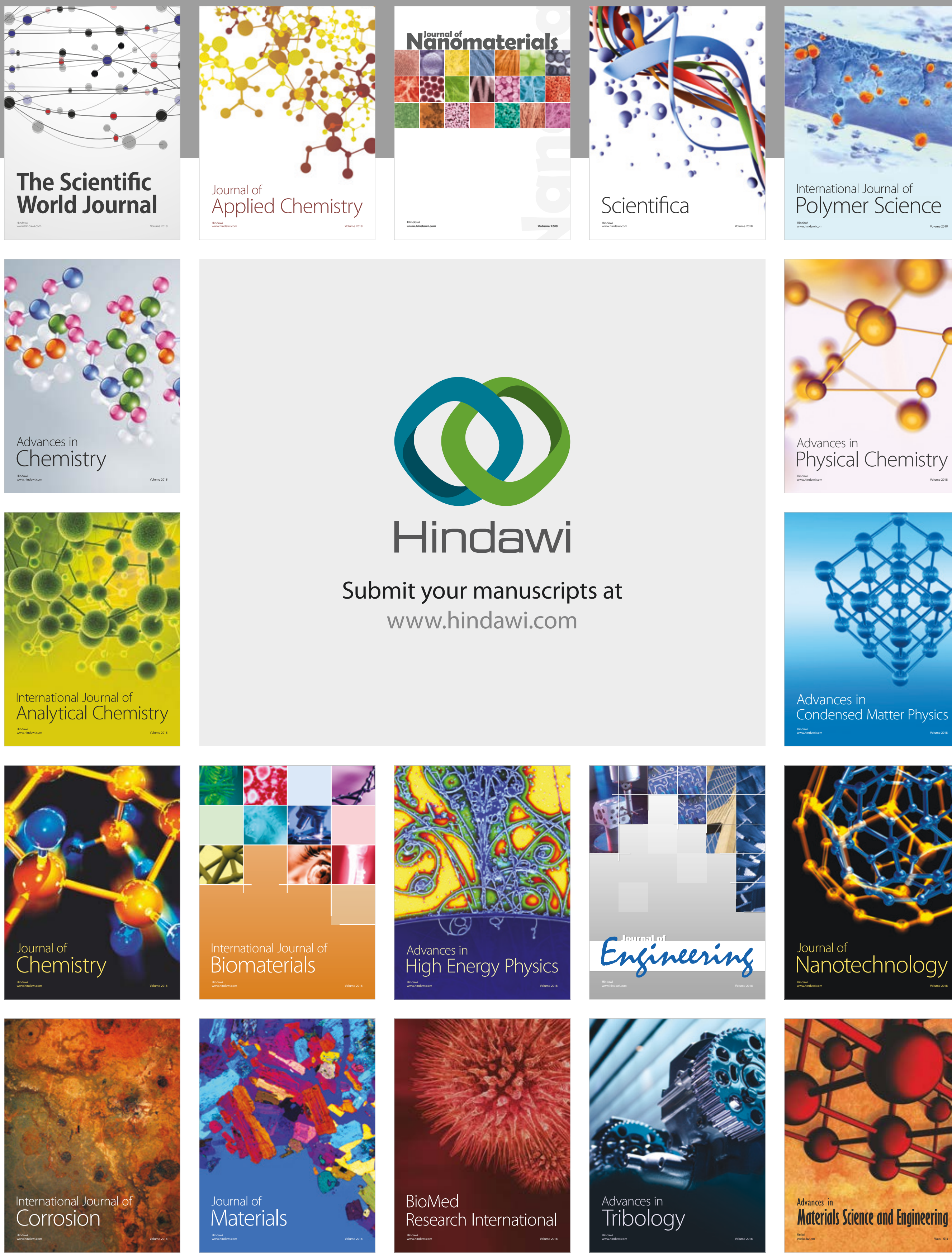
Iftikhar Ali Sahito
Chengyu Hong
Sung Hoon Jeong



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