



### Nano-materials and Nano-manufacturing

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This issue has nine interesting papers dedicated to nano-materials and nano-structured materials, including 0D quantum dots, 1D nanotubes, 2D graphene, thin films, nano-porous structures, nano-composites, and interfaces. Nano-materials and nano-structured materials have been widely studied for their brand new properties which are different from properties of their bulk counterparts, due to large surface-area-to-volume ratio, size effects, quantum confinements and so on.

Nanotubes are typical 1D materials. Song *et al.* (DOI: 10.30919/esmm5f193) explored and demonstrated that the multi-walled carbon nanotubes (MWCNTs) could serve as a promising adsorbent for methyl blue removal in wastewater. The MWCNTs-polyethylenimine adsorbent contributes to an enhancement of the adsorption capacity in methyl blue removal, where the maximum adsorption capacity is as high as 418 mg/g at 35 °C. As a review, Liu *et al.* (DOI: 10.30919/esmm5f199) go through the carbon nanotube and boron nitride nanotube in structure, property and synthesis methods.

For 2D material, Tang *et al.* (DOI: 10.30919/esmm5f203) simulated the thermal conductivity of recently synthesized 2D materials, namely graphene embedded with periodic four-membered and eight-membered rings (GFERs). Both the length and the temperature dependence of GFERs' thermal conductivity are found to be different from that of the pristine graphene. An obvious thermal rectification in graphene-GFERs heterostructures is also found.

The abundant findings on nano-materials benefit from the progress of nano-manufacturing. Vikram *et al.* (DOI: 10.30919/esmm5f205) synthesized lead sulfide (PbS) quantum dots (~ 6 nm) using a cost-effective and facile chemical synthesis method, namely ionic reaction. The strong size quantization was observed from cyclic voltammetry and absorption spectroscopy. Borate *et al.* (DOI: 10.30919/esmm5f202) investigated the effect of working gas pressure on the adhesive, structural, optical, morphology and electrical properties of Mo thin films to achieve better sputtering conditions. Furthermore, the performance of the fabricated Mo thin film was studied by using it as a working electrode in electrochemical deposition of Cu<sub>2</sub>ZnSnS<sub>4</sub> thin films.

Besides nano-materials, there are also works on manufacturing nano-structured materials. Bai *et al.* (DOI: 10.30919/esmm5f195) demonstrated that the crystallization of the Polylactide (PLA) matrix could significantly affect thermal conductivity of the PLA/boron nitride (BN) nano-composites, comparing to amorphous PLA matrix. When BN content is 40 wt%, the in-plane and through-plane thermal conductivities of the crystalline PLA/BN are 4.7 W/m·K and 0.8

W/m·K, respectively. These are increased by ~50 % from those of amorphous PLA matrix, due to the increased phonon mean free paths. Iwe *et al.* (DOI: 10.30919/esmm5f197) fabricated nano-porous silicon structures with antireflection coating at extremely low technology cost, which can comfortably replace the conventional cells. The surface reflection in visible, infrared and ultraviolet regions has been drastically reduced to smaller than 0.1% by using gradient porous silicon technique. Zhang *et al.* (DOI: 10.30919/esmm5f201) synthesized a series of Sr-doped hierarchical porous nanofiber structure, such as Li<sub>1.2</sub>Mn<sub>0.54</sub>Ni<sub>0.13</sub>Co<sub>0.13-x</sub>Sr<sub>x</sub>O<sub>2</sub>. As cathode materials in a Li-ion battery, such materials can enhance the cyclic performance, suppress the voltage decay and stabilize the structure. Shanmugam *et al.* (DOI: 10.30919/esmm5f207) adopted two different electrochemical surface treatments, anodization and micro-arc oxidation (MAO). On a Ti alloy, these treatments may improve bonding strength of the interface between the metal and composite.

In summary, the works in this issue have studied a wide range of properties of nano-materials, such as adsorption capacity, thermal conductivity, photo-absorption capability, discharge capacity in batteries, etc. Besides, it also includes some works of advanced nano-manufacturing on PbS quantum dots, Mo thin films, PLA/BN nano-composites, nano-porous Si, pore structure Li<sub>1.2</sub>Mn<sub>0.54</sub>Ni<sub>0.13</sub>Co<sub>0.13-x</sub>Sr<sub>x</sub>O<sub>2</sub> nanofibers, interfaces between Ti and a composite. These works can enhance the current understanding and lead to new research directions in nano-materials and nano-manufacturing. We are looking forward to many more exciting papers in coming issues.



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