Editorial

Carbon-Based Materials at Nanoscale

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Carbon-based nanomaterials (CBNs), namely, fullerene, carbon nanotubes, and graphene, have attracted significant attention since their discoveries, and in these days they play significant role in nanoscience and nanotechnology [1]. The unique properties of CBNs make them widely used in many fields ranging within material science [2], energy [3], environment [4, 5], biology [6–9], medicine [10, 11], and so forth. Articles published in this special issue reflect the broad application potential of CBNs and provide some overview of the recent progress in this field.

The paper by M. R. Sanaee and E. Bertran is focused on iron nanoparticles encapsulated by carbon shell. The authors present a synthesis of core/shell nanostructures by using a new modified arc discharge reactor. Different iron cores including spherical, oval, and multiple cores were synthesized. The carbon shell protecting the iron cores against oxidation shows high degree of crystallinity. Due to the carbon shell spherical shape and iron superparamagnetic behavior, the authors conclude that the carbon encapsulated iron nanoparticles can be potentially used in drug delivery. X. Li et al. showed that magnetic carbon nanocages synthesized from a cheap carbon source material lignin using low temperature carbonization process can be used as efficient and recycled adsorbents in the removal of dye stuff from textile wastewater.

The conductive polymeric composites based on multi-walled carbon nanotubes were studied by E. V. Santiago et al. By tailoring the epoxidized linseed oil matrix with groups rich in nonpolar electric density, as diacetylene, capable of

interacting by van der Waals forces, it was possible to improve the dispersion of carbon nanotubes without necessity of some modification knowing that those treatments usually affect lowering their electrical properties. The authors conclude that these composites may have potential application in vapor sensors. The effect of dielectric constant of some polystyrene-type polymer matrix on the percolation threshold in conductive polymer composites with carbon black is also studied. It is confirmed that the percolation threshold decreases while the dielectric constant increases.

The hybrid materials based on CBNs are usually stabilized by noncovalent interactions with dominating van der Waals forces. The theoretical simulations of the CBNs provide useful insight into stability and nature of such interactions [12]. W. Liu et al. studied the interactions between CO molecule and the pristine and defective graphene layers using the state-of-the-art density-function theory calculations. The results clearly demonstrate that the defective graphene could be a good sensor for CO. Using theoretical calculations Q. Wu et al. showed that band gap of carbon and boron nitride double-wall heteronanotubes (C/BN-DWHNTs) with different chirality and size could be tuned by intertube distance. Imposing an external electric field of zigzag DWHNTs provides further possibility for future electronic and electrooptic nanodevice applications.

Heterogeneous catalysis belongs to extensively studied disciplines with a huge application potential in industry. The catalytic activity of nanomaterials synthesized from carbon precursor nanomaterials was studied by M.-D. Dong

et al. The synthesized Co_3O_4 nanomaterials with different morphologies showed excellent catalytic activity for thermal decomposition of ammonium perchlorate and the Co_3O_4 nanorods with large BET surface area and pore volume had the highest catalytic activity. Organic solar cells are also extensively studied materials because they can be applied as sustainable source of energy. A. Manzano-Ramírez et al. reviewed the efficiency of graphene-based bulk heterojunction (BHJ) organic solar cells. The various applications of graphene as a constituent of BHJ organic solar cells were discussed focusing on the PCE achieved by the graphene-based devices.

Radio frequency magnetron sputtering was used for deposition of hydrogenated amorphous carbon films codoped with Si and Al ((Si, Al)/a-C:H) on Si (100) substrate at different temperatures. The substrate temperature effect on microstructure, mechanical, and tribological properties of the (Si, Al)/a-C:H films was studied and the correlation between the structure, mechanical, and tribological properties was also discussed by X. Liu et al.

We are confident that this special issue will provide new insights and inspiration to the interested reader for further work in the field of CBNs. Many individuals contributed to the success of this special issue.

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