J Nanomed Nanotechnol 2014, 5:5
http://dx.doi.org/10.4172/2157-7439.S1.019

OMICS Group Conferences
Accelerating Scientific Discovery

4th International Conference on
Nanotek & Expo

December 01-03, 2014 DoubleTree by Hilton Hotel San Francisco Airport, USA

Two dimensional nanomaterials for energy and electronics

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To date two dimensional graphene and transition metal dichalcogenides (TMDC) (e.g. MoS_2, WS_2) materials have created an immense research interests due to its extraordinary physical, chemical, and physiochemical properties, which delineated these materials as outstanding candidates for future electronics, optics, and energy-harvesting devices. Typically, graphene exhibits high electron mobility and optical transparency along with excellent mechanical properties and chemical inertness. In this context, we developed large scale graphene using chemical vapor deposition (CVD) process and transferred it to different flexible, transparent substrates for applications in different flexible optoelectronic devices and solar cells. The structural characterizations (Raman spectroscopy, HRTEM, AFM) of CVD graphene on metal foils and transferred graphene on flexible, transparent substrates show the presence of 3 to 4 atomic layers of graphene with thickness 1.5 nm. Furthermore, we developed and optimized different chemical doping and functionalizations protocols in order to enhance graphene's electrocatalytic activity towards tri-iodide (I_3^-) reduction for the application in dye sensitized solar cells (DSSC). We found that different chemical functionalizations help in the improvement of graphene's electrocatalytically active charge transfer sites with the shifting of its work function, which further enhances the DSSC efficiency. On the other hand, recent advances in atomically thin two dimensional (2-D) TMDC materials have also led to a variety of promising technologies for post-CMOS and future energy generation. We developed large scale TMDC materials using a vapor phase growth process and applications of those TMDC materials based large scale Schottky junction photo-sensor and photo-switch devices.

Biography

Santanu Das completed his PhD in the year of 2012 from Florida International University and did his Postdoctoral studies from the University of North Texas, College of Engineering. Currently, he is going to join as a Research Scientist at the Department of Materials Science and Engineering, University of North Texas. His research interests are synthesis and electrical, mechanical and electrochemical properties of nanostructured materials. He has published two book chapters, more than 30 SCI-indexed research articles in prestigious international peer reviewed journals and 8 peer reviewed conference proceedings. He has more than 228 citations in his published articles with his *h index* of 8 and holds 2 patents. He has more than 34 conference presentations, including some highly prestigious international conferences such as Materials Research Society Symposium (MRS), USA. He is also a recipient of several prestigious research awards, including prestigious MRS outstanding poster award in the fall 2013 annual meeting in Boston, USA. He is also serving as a reviewer of the several reputed international journals and honorary member of the several prestigious international scientific communities.

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Change of the physical properties of colored high density polyethethylene by effect of environment

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This study deals with the environment and different liquid environments effect on bath the color fastness and the mechanical properties – expressed as tensile strength and elongation – of colored high density polyethylene polymer in net form , used for warning and as an indicator for the undo ground pipes passage . It was found that withering affects the tensile strength and the elongation considerably, while change on temperature of the surroundings was of less effect. Also, environment liquids caused a small loss in tensile strength of about (6%) while the samples in extended percent or about (22%) was observed. Both parameters showed an appreciable change at damped soiling mud. The light fastness of the examined polymer samples were greatly affected by weathering conditions, while the other factors did not affect the light fastness considerably.

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