



Expanding the Application Space of Graphene-based Materials

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ABSTRACT

Graphene – a 2D arrangement of C-atoms is a multifunctional material that can transform technologies in several sectors. In this talk, I'll discuss three major activities in which we are contributing: (i) development of novel water-purification material from solution processed graphene and graphene-oxide with particular emphasis on transforming 'sand' – a main-stay filter material to 'super-sand' - graphene-oxide coated sand which improves filtration efficiencies by five to six times compared to 'sand' filtration [1]. I will also touch upon our recent experimental results which demonstrate that graphene-oxide can be chemically tailored to remove organic dye molecules with extremely large capacity (more than 2-3 orders of magnitude greater than the parent sand), (ii) protection of corrosion of metals by conformal ultra-thin graphene films produced by chemical vapor deposition [2], (iii) localized deoxygenation of graphene-oxide by focused ion beams for direct writing of electrically conducting (reduced graphene-oxide) structures on insulating graphene-oxide films. The technique is capable of generating features across 10s of nanometres to several microns in a mask-less and facile manner [3]. Despite the disparate nature of the topics the overarching goal is to rationally expand the application space of this 'wonder' material in water purification, protection of corrosion of metals and novel energy storage architectures.

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BIOGRAPHY

Mainak Majumder received his PhD in 2007 from the University of Kentucky, USA. He conducted postdoctoral research at Rice University, USA for a couple of years. From March 2010 he is at the Department of Mechanical and Aerospace Engineering of Monash University currently serving as a senior lecturer while leading a research group of two postdoctoral researchers and six postgraduate students. His research at the nanoscale is funded by the Australian Research Council through the ARC Discovery and ARC Linkage schemes.

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