Graphene-Based and Graphene-Derived Porous Materials

Xinliang Feng

Technische Universitaet Dresden, Germany

Recent progress of graphene research has triggered wide interest in 2D nanomaterials and related porous nanocomposites/hybrids other than carbons. In this presentation, we will firstly discuss the efficient exfoliation of graphene, aiming at the large-scale production of high-quality, thin layers, solution-processable graphene sheet materials. We will further present a bottom-up assembly approach to the fabrication of porous materials based on chemically derived graphene. For the first approach, different graphene-based porous nanosheets such as carbon, metal, metal oxide, and nanohybrides will be produced to possess the intriguing features such as thin thinness, large aspect ratio, high monodispersity and large surface area. For the second strategy, nanosandwiches based on graphene coupled with organic porous materials will be produced. The conjugated microporous polymers, Schiff-base porous polymers and polyaryltriazine-derived frameworks are thus grown on graphene surface, exhibiting strongly coupled effects. The porous features of such graphene/organic porous materials can be tailored at the molecular level. Finally, 3D porous architectures will be built up based on the assembly of graphene sheets and nanosandwiches. These materials show hierarchical porous structures with high surface areas which can facilitate the diffusion of guest ions or molecules in many electrochemical systems. As the consequence, graphene-based and graphene-derived porous materials may hold great potential in the areas of catalysis, sensors, supercapacitors and batteries.

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