Three-dimensional graphene nanocomposites for gas storage

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Development of advanced material for H_2 storage is the most technically challenging barriers for the widespread use of hydrogen based renewable energy. In this research, we report the synthesis and hybridization of 3D macroporous graphene nanocomposite for applications into gas capture. Taking full advantages of the microporosity for a large surface and the macroporosity for the fast gas accessibility and diffusion, 3D graphenes would achieve the greater H_2 capacity over graphene powder. To further improve the capacity, 3D graphenes are used as a supporting material of active material. These features of 3D graphenes suitable for H_2 storage are demonstrated here by performing the comparative studies of graphene oxides, 3D graphenes, and 3D graphene nanocomposite hybrids. The graphene oxides, 3D graphenes, and 3D graphene nanocomposite hybrids were characterized by scanning electron microscopy (SEM), transmission electron microscopy (TEM), x-ray diffractometry (XRD) spectra, Raman spectrum, x-ray photoelectron spectroscopy (XPS), Brunauer-Emmett-Teller (BET) specific surface area analysis, and high pressure H2 adsorption.