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Three dimensional Porous Architectures from Carbon Nanomaterials Based Hydrogels ARCHI DASGUPTA, The Pennsylvania State University, BUNSHI FUGETSU, Hokkaido Univ, LAKSHMYPULLICKEL RAJKUMAR, NÉSTOR PEREA-LÓPEZ, ANA LAURA ELÍAS, MAURICIO TERRONES, The Pennsylvania State University — Carbon nanotube (CNT) and graphene oxide (GO) based macroscopic solids with a light weight, high porosity and large surface area are of great importance for applications such as in energy, as electrodes in batteries, in medicine, as scaffolds for tissue regeneration and in environment for absorption and filtration materials. However, establishing 3-Dimensional interconnected Carbon nanomaterial structures with controlled porosity and functionality is still in its infancy. Here we report reproducible and inexpensive methods to obtain macroscopic 3D solids consisting of CNT and graphene oxide, with or without polymers as backbones. The hydrogels are formed by simply mixing graphene oxide dispersed in water, carbon nanotubes and polymers. The hydrogels are then subjected to freeze-drying that results in ultralight, macroporous and stable solid. The porosity of the 3D solid can be controlled by the freezing protocol. When using a thermal gradient during freezing (unidirectional freezing), homogenous pore alignment within the solid is achieved. Field emission scanning electron microscopy (FESEM) and thermogravimetric analysis (TGA) are employed for characterizing the materials. Processing of similar solids with nitrogen-doped CNTs and functionalized CNTs will also be presented.

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None

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