Ultralight and Highly Compressible Nitrogen-doped Graphene/Magnetic Carbon Microspheres Composite Aerogel

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For graphene aerogels prepared by hydrothermal method, graphene sheets are prone to stack because of the strong interaction (π-π bond and van der Waals force) between the graphene sheets in solution, resulting in their deficient pore structure, fragile texture and inadequate mechanical property. In this research, to solve this problem, three dimensional nitrogen-doped graphene/magnetic carbon microsphere aerogel (NGA/MCMS) was obtained through in-situ electrostatic self-assembly process by one-step hydrothermal method using weakly alkaline ammonium citrate as reducing agent and nitrogen source, graphene oxide and magnetic carbon microsphere (MCMS)as precursors. During assembly process, the point-to-point contact between MCNSs can be transformed into point-to-face contact between MCMS and graphene sheet, which can effectively inhibit the aggregation of graphene sheets. The obtained ultra-light composite aerogels own good magnetic properties, excellent compressibility (up to 90%), and extremely low density (~ 7.59 mg/cm^3). These outstanding features can endow NGA/MCMS with extensive application in many fields including energy (capture, storage, conversion), sensing, catalysis, adsorption, separation, and so on.

Keywords: Composite graphene aerogel, Compressibility, Ammonium citrate, Magnetism