Enhanced Adsorption of Hierarchically Porous Graphene Architectures by Physical Activation

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Recently, the porous carbon solids have received significant attentions for the capture of CO_2 and SO_2 due to their structural tuability, thermal stability, low density, and diverse chemistries. Herein, we demonstrate large surface area (> 1600 m^2/g) and ultrahigh porosity (> 98%) of three-dimensional (3D) ultralight, macro- and micro-porous reduced graphene oxide (m^2-rGO) monoliths by simple and clean steam (or CO2) activation chemistry. The resultant steam (CO_2)-actived m^2-rGO adsorbents are applied into CO_2 & SO_2 capture to demonstrate the superiority of hierarchical textures and structures. The steam (or CO_2) activated 3D m^2-rGO monoliths are attractive as high capacitive materials because of facile accessibility to adsorption site and fast mass transport. Furthermore, the macroscopically monolithic adsorbents assembled by nanoscopic graphene multilayers can expand their applicative fields because handling them is easier than doing powdery sorbents and monoliths are chemically and structurally uniform and thus, more fitted to process applications.