Preparation and organic solvent adsorption of PTFE fabric reinforced GO/SiO_2 aerogel

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Abstract

Aerogel is an excellent type of nano-porous amorphous solid material, it has great prospects in adsorption field due to high porosity[1], low density and high specific surface area. Among them, the SiO_2 aerogel has a uniform skeleton structure and pore size distribution, with the porosity of 80 ~ 99.8% and specific surface area of 100 ~ 1000 m^2/g, which is the most typical aerogel material. However, the hydrophilicity and fragility of SiO_2 aerogel has limited its development. Graphene, as a sturdy but pliable membrane, it has a large theoretical specific surface area (2630 m^2/g) and Young's modulus (1.0 TPa). In some ways, the hydrophobicity of SiO_2 aerogel can greatly be improved by adding graphene, but for fragility, it still hard to solve.

In this paper, the adsorption capacity of SiO_2 aerogel has been greatly improved with the cross-linking of graphene and composition of PTFE fabric via sol-gel method and CO_2 supercritical drying technique. The effects of MTMS/GO molar ratios are investigated, it can be obtained that the GO/SiO_2 aerogel has a large specific surface area of 551m^2/g and high pore volume of 2.2 cm^3/g. Meanwhile, as an excellent adsorbent, hydrophobic property is a prerequisite for it, the contact angle of PTFE fabric reinforced GO/SiO_2 aerogel is up to 152.8°. In terms of adsorption capacity, the result shows that can reach the value of 10.87 g/g for NMP and 9.24 g/g for cyclohexane. Furthermore, it can still remain the initial adsorption of 78.3 % to 85.9 % after several cycles. It is noted that the first-order kinetic model is used to prove the adsorption validity, which achieves a fitting degree over 99 %.

Keywords

SiO_2 aerogel; Adsorption ability; First-order kinetic

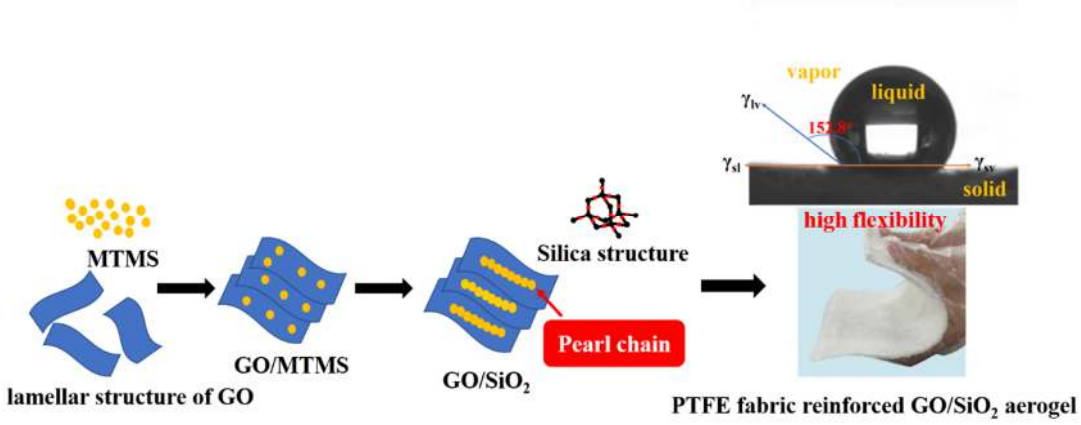

Fig.1 Schematic diagram of GO/SiO2 aerogel

Reference

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