

Hydrophobic silica aerogels using phenyl surface modification by co-precursor method

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ABSTRACT

Silica aerogel was synthesized using phenyltrimethoxysilane (PTMS) and tetraethoxysilane (TEOS) co-precursor with different molar ratios by sol-gel process followed by the supercritical alcohol drying. The hydrolysis and condensation reaction were carried out in presence of Oxalic acid and ammonium hydroxide as acid and base catalysts, respectively. The optimized molar ratio for TEOS:Methanol (MeOH):Oxalic acid (0.01 M):NH₄OH (1 M) was kept constant at 1:30:2:2. The molar ratio of PTMS was varied from 0 to 1 to tune the synthesized aerogel properties. The PTMS/TEOS composite silica aerogel were analyzed for the, chemical interaction, surface morphology, hydrophobicity, and textural characteristics. The functional groups and chemical bonds present in the hydrophobic silica aerogels were confirmed by FTIR analysis. The obtained silica aerogel materials show enhancement in the hydrophobicity (76°-149°), high specific surface area (398 m²/g to 739 m²/g). This type of hydrophobic silica aerogels can be used in thermal insulation applications.

Keywords: silica aerogel; co-precursor method; phenyl surface modification; supercritical drying.

Acknowledgement: This work was supported by the National Research Foundation of Korea (NRF) grant funded by the Korea government(MSIT) (No. 2020R1A5A1019131). This work was supported by the Human Resources Development program (No. 20204030200110) of the Korea Institute of Energy Technology Evaluation and Planning(KETEP) grant funded by the Korea government Ministry of Trade, Industry and Energy.

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