UNIVERSITY OF WYOMING
Wyoming Technology Transfer and Research Products Center

Method of Silica Aerogel Fabrication Using Fly Ash and Trona Ore

UW ID: 18-016

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Patent Status:

Patent Pending

Description of Technology

Silica aerogel is an extremely lightweight material that is made up of 95% air. It is very strong in compression with respect to its weight. This material has been around for a long time but uses are just starting to surface as it becomes more available. One of these uses is to insulate electronics on NASA's Mars Exploration Rovers.

Researchers at the University of Wyoming have invented two new techniques for fabrication of silica aerogels. The first method uses fly ash and trona ore as the starting materials. These two materials are mixed, then go through multiple processing and washing cycles, and then are dried in ambient pressure in order to create silica aerogels. The final product presents special characteristics including: 1) high thermal stability for maintaining hydrophobicity up to 476˚C 2) contact angle of the as-dried silica aerogel as high as 151˚ 3) silica particle size of ca. 3-6nm 4) the 500˚C heat treatment sample possessing a large surface area of 856.2 m2/g, a large pore volume of 2.92 cm3/g, and an average pore diameter of 17.1 nm.

The second method is a novel and environmentally friendly way to create silica aerogels by using CO2 as the gelation agent and drying in ambient pressure. The produced aerogel has a contact angle as high as 154˚. The specific surface area of the aerogel product approaches the peak value of 643.9 m2/g and the pore volume reaches the maximum value of 1.45 cm3/g at 400˚C. This technique develops a way to reuse captured CO2 for value-added product manufacturing.

Applications

This technology invents a new way to create silica aerogel at ambient pressure which should help make it more easily available. The second method can also turn a pollutant into a value-added product. Silica aerogel can be used for a multitude of applications such as sound insulations and NASA using it to insulate electronics.

Features & Benefits

- High thermal stability
- Large contact area
- Dries at ambient temperature to avoid expensive pressure treatments

Figure: Photographs of (a) fly ash, (b) trona ore, (c) calcination mixture, and (d) the resulting silica aerogel

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