# Production of aerogel (micro)particles: state of the art and recent advances

Pavel Gurikov [a,*] and Irina Smirnova [a]
[a] Hamburg University of Technology, Institute of Thermal Separation Processes, Eißendorfer Str. 38, Hamburg 21073, Germany
* pavel.gurikov@tuhh.de

Aerogels are low-density (typically <0.2 g $cm^{-3}$), highly porous (>90% v/v) nanostructured solids. Aerogels possess very low thermal conductivities, high acoustic attenuation, mesoporous space and high specific surface area. Further they may host functional guests with useful chemical, electrical, magnetic or optical properties, or exhibit a second functional component directly within the matrix. Aerogels are produced in a multistep process that involves gelation in a mold, solvent exchange and supercritical drying. This process results in monolithic aerogels. Many applications such as adsorption (gas and humidity filters), personal care (cosmetics) and food additives do not require monoliths, but rather particles within a certain size range. Moreover, the production of aerogels directly in form of particles has a tremendous advantage: duration of the solvent exchange supercritical drying for small particles is much shorter than that of monoliths by a factor of 10-100, allowing for significant process costs reduction.

The production process of such particles requires additional steps such as dripping, emulsification followed by gelation, spraying or shredding of the wet gel. In this contribution we discuss the state of the art of the aerogel production in particulate form. A comprehensive comparison of the method in terms of particle size, throughput, energy input and integrability with further production steps are discussed. Special attention is given to emulsion gelation as the most studied method. We present recent advances in this field such as drop-on-demand jetting, inkjet printing and others. Emerging applications of aerogel (micro)particles are outlined.

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