Hamburg University of Technology (TUHH)
Institute of Thermal Separation Processes -V8-
Eissendorfer Str. 38, DE-21073 Hamburg

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Abstract Formulary

Presentation type: **Oral** ☐ **Poster** ✔

Title: Analytical and Computational Investigation of Upscaling Effects in Aerogel Production

Authors: Adam Dzierbinski, Ameya Rege, Emrah Okumus, Pascal Voepel, Barbara Milow

Presenting author: Adam Dzierbinski

Institution (Presenter): German Aerospace Center (DLR)

ABSTRACT (Space limited to 2200 characters)

Owing to their outstanding properties, including popular features like low density and thermal conductivity, aerogels are almost predestined for applications in aviation and aerospace. However, some material geometries are currently not readily commercially available, thus rendering upscaling in research and development an important aspect.
Since aerogel preparation involves multiple steps, all of those need to be considered when developing upscaling routines. These steps include sol preparation, gelation, washing of the solvogel, and subsequent drying to obtain the aerogel. The ever-increasing importance of sustainability is only emphasized when considering such processes. Especially washing generates considerable amounts of solvent waste requiring time-consuming and costly work-up procedures having a significant environmental impact, calling for an optimisation.
The presented work focuses on the preparation of a flexible silica aerogel[1,2] composite in a pilot scale with maximum sample dimensions of 100 cm x 120 cm x 1 cm and the challenges that arise during upscaling. In order to minimise solvent consumption and validate the efficiency of the washing process, which is performed inside the reactor before removing the final product, the solvent flow within the aerogel is monitored experimentally by means of optical methods and NMR spectroscopy and simulated by developing a mass transport model. After completing the washing process, the aerogel is dried and examined for inhomogeneities using various analytical methods, including, but not limited to, thermal conductivity and density.

This work was performed within the project MATKABIN (funding number 20Q1908B) and is supported by the Federal Ministry of Economics and Climate Action.

[1] G. Hayase, K. Kanamori, K. Nakanishi, Journal of Materials Chemistry 2011, 21, 17077-17079.
[2] European patent: EP3042884A1