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

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Abstract Formulary

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Title: Metal oxide aerogels directrly formed in sucpercitical CO2 using metal carbonyls as precursors

Authors: I.V. Elmanovich, V.V. Zefirov, M.O. Gallyamov

Presenting author: I.V. Elmanovich

Institution (Presenter): Faculty of Physics, M.V. Lomonosov Moscow State University

ABSTRACT (Space limited to 2200 characters)

In this work we investigate an approach to metal oxide aerogels synthesis in a one-step process directly in supercritical CO2. Manganese oxide, iron oxide, tungsten oxide and cobalt aerogels are formed through a thermal decomposition of the corresponding metal carbonyl in oxygen-enriched CO_2. For MnO_x and FeO_x, after the procedure the high-pressure vessel is completely and uniformly filled with the aerogel with density as low as 5 mg/cm^3 and specific surface area up to 170 m^2/g. It is important to note, that monolithic manganese oxide aerogels are formed in this process in the scope of just 4 hours in a one-pot one-step process. Electron microscopy study revealed that the morphology of the materials is very close to that of a "classic" silica aerogel with globular particles linked to each other to form a necklace-like structure. For WO_x and CoO_x materials the monolithic structure is not achieved throughout the high-pressure vessel. However, the formed nanoparticles have branched low-density structures.

Exploring the process further, it can be demonstrated that composite metal oxide/carbon aerogels can also be prepared through thermal decomposition of metal carbonyls in oxygen-enriched sc CO_2. Here, carbon aerogel is placed inside the high-pressure vessel and acts as a substrate. After the process, the pores of the carbon aerogel are filled with metal oxide nanoparticles. The results of the study of chemical composition and porous structure are presented in the work.

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