Wafer-Scale Fabrication of Hierarchically Porous Silicon and Silica by Active Nanoparticle-Assisted Chemical Etching and Pseudomorphic Thermal Oxidation

Data-DOI: https://doi.org/10.15480/336.4620

Handle: http://hdl.handle.net/11420/13708

Other Identifier: urn:nbn:de:gbv:830-882.0198153

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The datasets presented here in the .zip-folder named *"FabricationOfHp-Si_Gries_et-al_SupplementInformation"* belong to the Collaborative Research Centre CRC 986 "Tailor-Made Multi-Scale Materials Systems" with the project number 192346071.

Those data complement the article titled "*Wafer-Scale Fabrication of Hierarchically Porous Silicon and Silica by Active Nanoparticle-Assisted Chemical Etching and Pseudomorphic*

Thermal Oxidation" by Gries et.al. in which the synthesis and characterization of hierarchically porous silicon (hp-Si) is described.
Hp-Si is fabricated in a two-step combination of photo-electric etching and metal-assisted-chemical etching with silver nanoparticles (AgNP).
The straight macropores are etched first electrochemically and the mesoporous network, which connects the macropores, is afterwards etched with self-propelled AgNP which selectively dissolve the silicon on their trajectories through the silicon scaffold structure.

For a full-understanding of the results raw data and reconstructed tomography measurements from the multiscale imaging analysis are needed.
In the supplement information results from scanning electron microscopy (SEM) for silicon and silica can be found in the folder '*hpSi_hpSiO2_SEM_Originals*'. Those images underline the visual appearance of the hp-structure which interconnects as a sponge-like network the parallel, straight and hexagonally arranged macro-scaled 1 µm pores.
To characterize the bimodal pore sizes on all length scales three different imaging and tomography methods were performed.
First, focused ion beam and scanning electron microscopy (FIB-SEM) in a slice-and-view mode was used. Single electron micrographs were taken while the ion beam dug into the substrate and reconstructed into a 3D model. Single images were segmented and evaluated to achieve information about the macropore sizes, the surface roughness, the surface area and a rough estimation of the pore volume. The raw data can be found in '*FIB-SEM_slice-and-view_images*'.
Second, transmission electron tomography (TEM) on a single mesopore from the macropore walls was carried out to get a better understanding of the resulting pore shapes. The reconstruction of the used needle shaped sample with a single mesopore can be found in folder '*ReconstructionTEMTomo*'.
Since the structural characterization is based on imaging methods and their analysis no more data are needed to understand the research behind this article. An overview of the results generated with the Avizo-Software can be found in the folder *"EvaluationOfImagingData"*.