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Microstructural Control of Mesoporous SnO_2 Powders and Their H_2 Sensing Properties

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Several approaches have been tested to reduce the size of mesoporous tin oxide (m-SnO_2) agglomerates prepared by utilizing the self-assembly of *n*-cetylpyridinium chloride. The variables and methods tested were the mixing ratio of $Na_2SnO_3{\cdot}3H_2O$ as a tin source and trimethylbenzene in the precursor solution, stirring or ultrasonic treatment after the hydrolysis of the precursor solution, and mechanical grinding of resulting m-SnO_2 powders in an agate motor. Among them, ultrasonic treatment immediately after the hydrolysis of $Na_2SnO_3{\cdot}3H_2O$ was very effective in reducing agglomerate size and in obtaining a large specific surface area (SSA) of more than 300 $m^2\ g^{-1}$, even after calcination at 600°C for 5 h, while grinding in the agate mortar after the calcination led to a decrease in SSA of all m-SnO_2 powders. The m-SnO_2 sensor fabricated with ultrasonically treated powder showed relatively high H_2 sensing properties, probably owing to the small-size agglomerates and large SSA.

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