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Dual-Templating Approach to Ordered Mesoporous Pt Nanowires with Various Morphologies

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Abstract

Herein, we report a universal approach for fabricating mesoporous Pt nanowires with controlled mesostructures from a dual template using anodic aluminum oxide (AAO) membrane with silica nanospheres assembled in the channels. The mesoporous Pt nanowires with well-ordered mesopores are successfully prepared by chemical reduction deposition method. In addition, we show a variety of mesopore arrangements in the Pt nanowires (such as linear, zigzag, and meshy topologies) for different values of the D (the ratio of the AAO channel (d_1) and silica sphere diameter (d_2)) factor ranging between 1 and $1+\sqrt{2}$ (≈ 2.414). The present approach is anticipated to work on the preparation of mesoporous nanowires of other metals (e.g., Au, Ni, and Pd) or alloys (e.g., Pt-Ni, and Pt-Ru alloys) with various topologies that may be promising as potential candidates for the next generation nanodevices and other applications (e.g., fuel cells and catalysis).

Keywords Pt nanowire; Porous materials; Ordered mesoporous structure; Dual-templating method; Structural

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