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Porous Anodic Aluminum Oxide with Serrated Nanochannels

DONGDONG LI, Univ of Southern California, LIANG ZHAO, Tsinghua University, JIA G. LU, Univ of Southern California — Self-assembled nanoporous anodic aluminum oxide (AAO) membrane with straight channels has long been an important tool in synthesizing highly ordered and vertically aligned quasi-1D nanostructures for various applications. Recently shape-selective nanomaterials have been achieved using AAO as a template. It is envisioned that nanowires with multi-branches will significantly increase the active functional sites for applications as sensors, catalysts, chemical cells, *etc.* Here AAO membranes with serrated nanochannels have been successfully fabricated via a two-step anodization method. The serrated channels with periodic intervals are aligned at an angle of $\sim 25^{\text{circ}}$ along the stem channels. The formation of the serrated channels is attributed to the evolution of oxygen gas bubbles and the resulted plastic deformation in oxide membrane. In order to reveal the inside channel structure, Platinum are electrodeposited into the AAO template. The as-synthesized serrated Pt nanowires demonstrate a superior electrocatalytic activity. This is attributed to the enhanced electric field strength around serrated tips as shown in the electric field simulation by COMOSL. Moreover, hierarchical serrated/straight hybrid structures can be constructed using this simple and novel self assembly technique.

Jia G. Lu
Univ of Southern California

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