

Extended arrays of vertically aligned sub-10 nm diameter [100] Si nanowires by metal-assisted chemical etching

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Supporting Information

A. Fabrication of AAO mask

The AAO membrane was prepared by a two-step anodization process. The first anodization was conducted in 0.3M H₂SO₄ at 25V at 0°C for 16 hours. After the first anodization, the amorphous alumina was removed by an acid mixture solution (6 wt.% H₃PO₄ and 1.8 wt.% CrO₃) at 45 °C for 8 hours. The second anodization was conducted with the same recipe as for the first anodization except that the anodization time was reduced to 5 minutes. With this second anodization time, we can obtain an ultra-thin AAO membrane with a thickness of *ca.* 300 nm. Polystyrene (PS) was cast onto the surface of the AAO membrane by spin-coating (3000 rpm, 1 min) with PS/Chloroform solution. After spin-coating, the PS/AAO membrane was dried on a 80°C hotplate for 15 minutes. Coated with PS layer, the membrane had a hydrophobic surface and could float on the surface of an aqueous solution. Thus the Al and barrier layer on the back side of

PS/AAO membrane were selectively etched off by floating the membrane on the surface of a CuCl_2/HCl mixture solution and the surface of a 5 wt.% H_3PO_4 solution (30°C, 15 min.), respectively.

B. SEM images of SiNW arrays

SiNW arrays were fabricated with the assistance of metal films with thicknesses ranging from 13 nm to 26 nm. In case that Si was etched in the presence of Ag, the etching rate was very fast. Therefore for small diameters (less than 20 nm) SiNWs it was hard to control the length of SiNWs. Accordingly, SiNWs easily become so long that SiNWs would form bundles after the evaporation of the solvent; even if the etching time was as short as 10 seconds. In order to reduce the etching rate and obtain free-standing SiNWs, Au was used to assist the etching in this series of experiments. As shown in Figure S1, when the thickness of the metal films was increased, the diameter of SiNWs decreased, and the number of sites where SiNWs were missing increased.

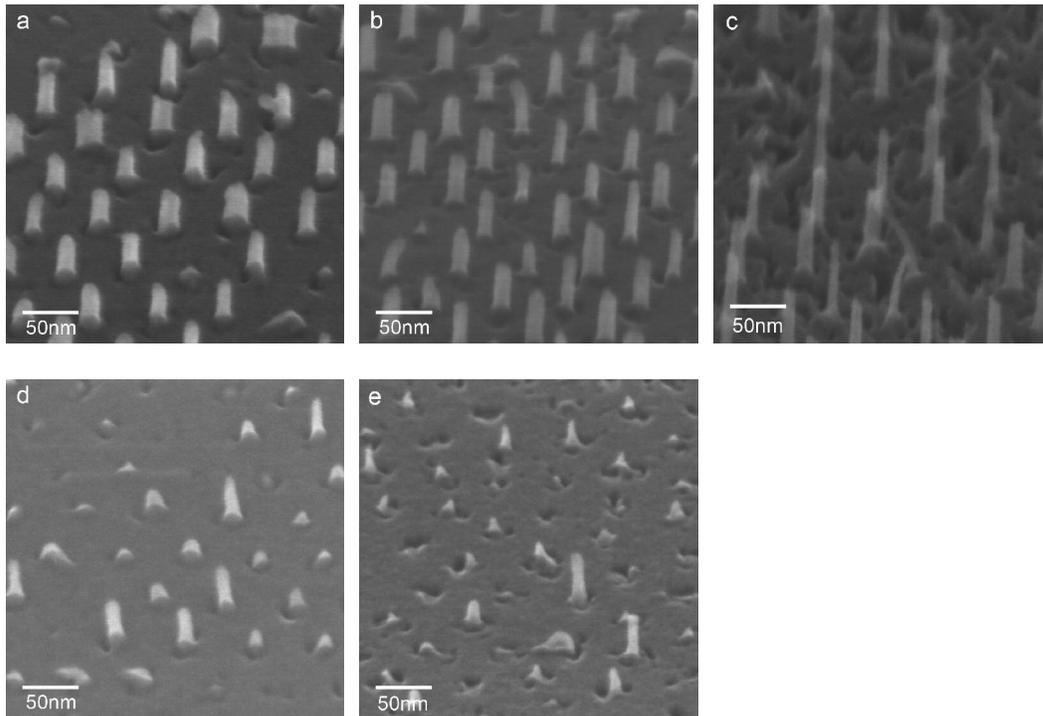


Figure S1. SEM images of SiNW arrays fabricated with gold films of different thicknesses: (a) 13 nm, (b) 16 nm, (c) 20 nm, (d) 23 nm, (e) 26 nm. Etching time was 30 seconds.