Electronic Supplementary Material (ESI) for RSC Advances

Electronic Supplementary Information for

Template-Free Fabrication of Cylindrical Macropore Array in SnO_2

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General Procedures

Scanning electron microscope (SEM) was recorded on a Hitachi S-3500 N and Hitachi S-5200 (Hitachi, Ibaragi, Japan). X-ray diffraction patterns were measured with CuKα radiation using a Rigaku Smart Lab-Pro (Tokyo, Japan) at room temperature. The electric furnace (black mini-I) was purchased from Nitto science Co., Ltd. (Nagoya, Japan). Tin(IV) *tert*-butoxide was purchased from Sigma-Aldrich Japan, Co. (Tokyo, Japan). Tin(IV) isopropoxide (10% w/v in isopropanol) was purchased from Alfa Aesar, Co. (Tokyo, Japan) and tin(IV) ethoxide was purchased from Kojundo Chemical Laboratory Co., Ltd. (Saitama, Japan). Ethanol (Japan alcohol sale Co., INC., Tokyo, Japan) and *t*-butyl alcohol (Kanto Chemical Co., INC., Tokyo, Japan) were purified by general method. Water was deionized with a Millipore Milli-Q water purification system.

Method

Fabrication of SnO_2 macroporous membranes

Tin(IV) *tert*-butoxide was scooped by the use of a circular loop (diameter: 3.5 mm) of Pt wire to form a liquid film. The film was dipped into deionized water at room temperature. As the sol-gel process proceeded, the film was gradually swollen (Movie S1). After 1 minute, the swollen film was dried to obtain a cylindrical macropore array of SnO_2.

Fabrication of SnO_2 macroporous membranes in binary solvents (*t*-butyl alcohol/H_2O)

Tin(IV) *tert*-butoxide was scooped by the use of a circular loop (diameter: 3.5 mm) of Pt wire to form a liquid film. The film was dipped into binary solvents (*t*-butyl alcohol/H_2O) at different ratio (0/10-5/5) at room temperature. After 1 minute, the swollen film was dried to obtain a cylindrical macropore array of SnO_2 .

Calcination of SnO_2

SnO_2 (23 mg) having cylindrical macropore array was heated to 450 °C for 1 h in an electric furnace, in order to transform amorphous SnO_2 to crystalline material. After cooling to room temperature, SnO_2 crystalline solid (17 mg) was obtained. The obtained solid was characterized by means of XRD and SEM can include the Materials and Methods here. Additional references should be cited here and included in the main reference list.

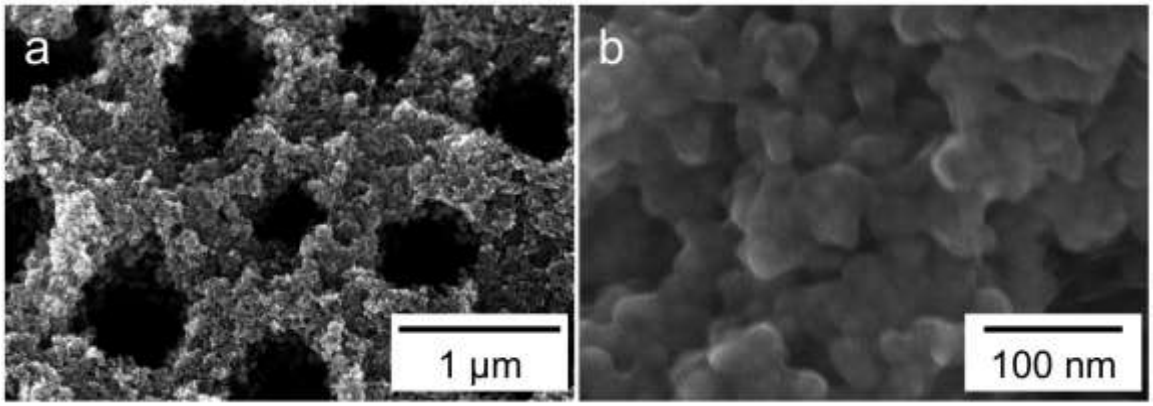

Fig. S1 (a) High resolution SEM images of cylindrical macropore array of SnO_2 and (b) its magnified image, which shows mesoporous structure, observed by Hitachi S-5200.

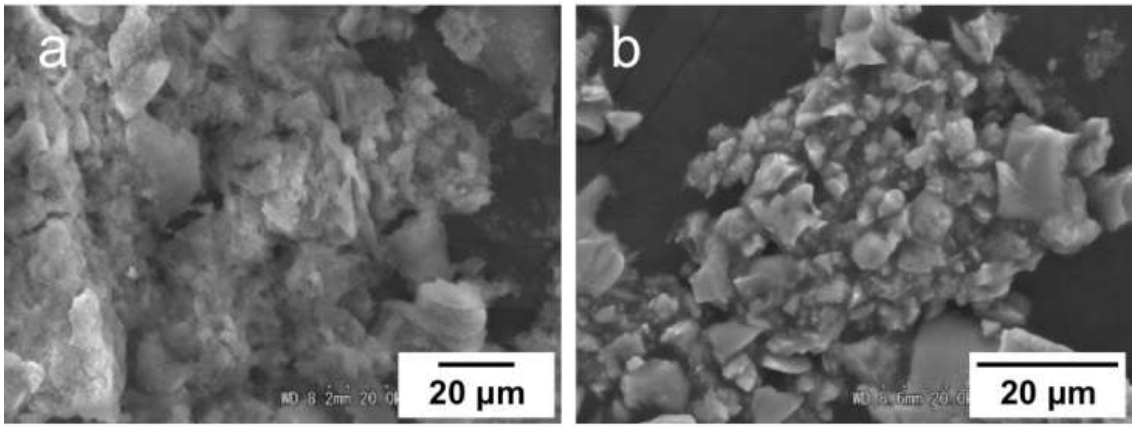

Fig. S2 SEM images of SnO_2, (a) synthesized from tin(IV) ethoxide and (b) from tin(IV) isopropoxide.

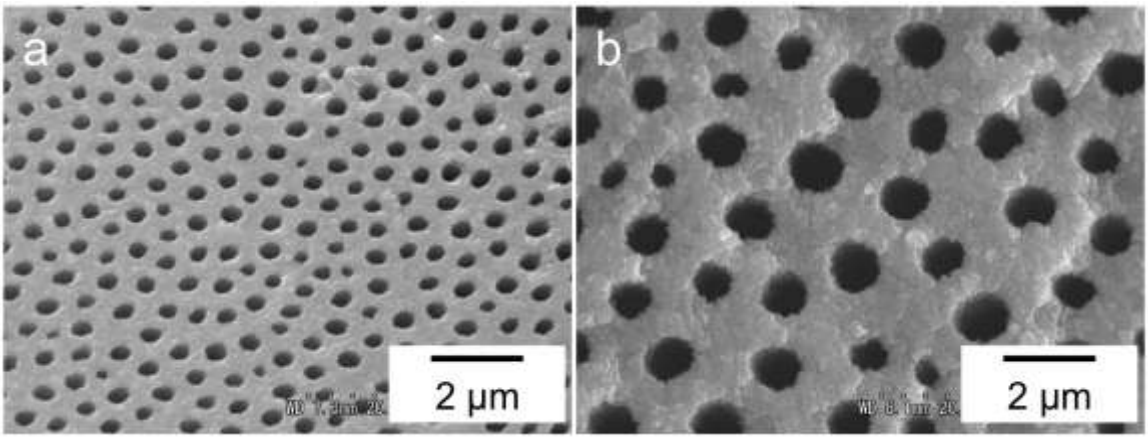

Fig. S3 SEM images of SnO_2 porous membranes produced at different temperature, (a) 3.2 °C and (b) 27. 0 °C (room temperature).

Movie S1 Synthesis of cylindrical macroporous array based on SnO_2 by dipping a liquid film of tin(IV) *tert*-butoxide into deionized water at room temperature.