SiC mesoporous membranes for sulfuric acid decomposition at high temperatures in the iodine-sulfur process

Electronic supplementary information

Xin Yu,[a] Qing Wang,[a] Hiroki Nagasawa,[a] Masakoto Kanezashi,[a] and Toshinori Tsuru[a*]

[a] Department of Chemical Engineering, Graduate School of Engineering, Hiroshima University, 1-4-1 Kagamiyama, Higashi-Hiroshima 739-8527, Japan

Corresponding author. Department of Chemical Engineering, Graduate School of Engineering, Hiroshima University, 1-4-1 Kagamiyama, Higashi-hiroshima 739-8527, Japan.
E-mail address: tsuru@hiroshima-u.ac.jp

ESI-1

Hydrothermal and chemical stability test for metal oxide

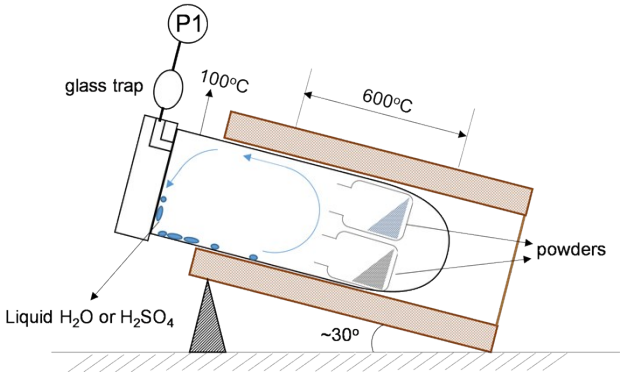

Fig. S1. Schematic diagram of the homemade device for the exposure of powders under H_2O or H_2SO_4 vapor. P1 is an automatic exhaust valve used to keep the closed system under a safe pressure of 1 bar. Liquid H_2O or H_2SO_4 can follow the cycles: vapor at 600 °C.

ESI-2

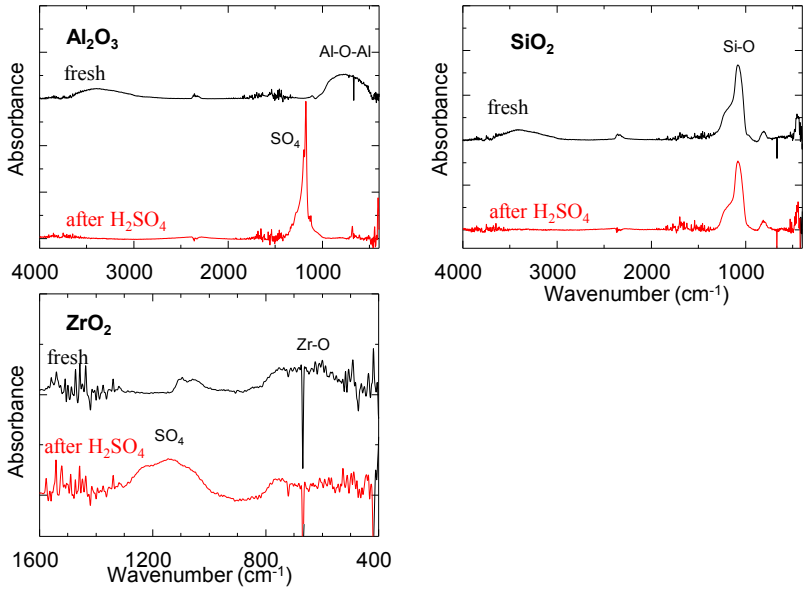

Fig. S2. FTIR spectra of α-Al_2O_3, SiO_2 and SiO_2-ZrO_2 before and after H_2SO_4 exposure at 600 °C were investigated via ATR-FTIR (FT/IR-4100, Jasco, Japan) using an MCT detector cooled with liquid nitrogen. S-O peaks in Al_2O_3, and ZrO_2 powders are cited from references.[4, 5]

ESI-3

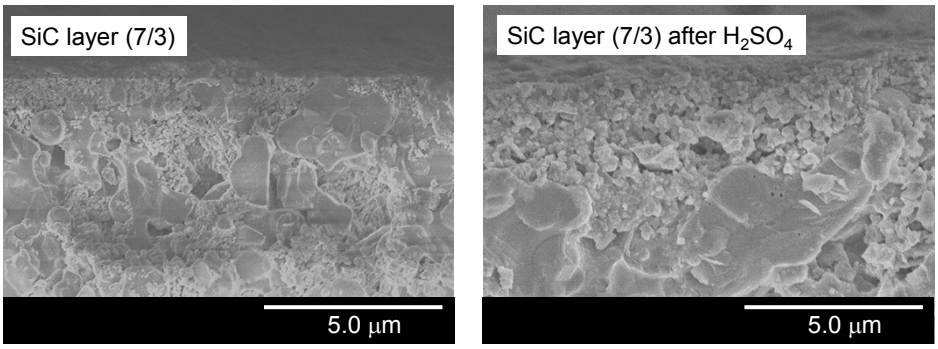

Fig. S3. Cross-section of Al_2O_3 layer (SiO_2-ZrO_2=7/3) and SiC layer (SiO_2-ZrO_2=7/3) before and after H_2SO_4 exposure.

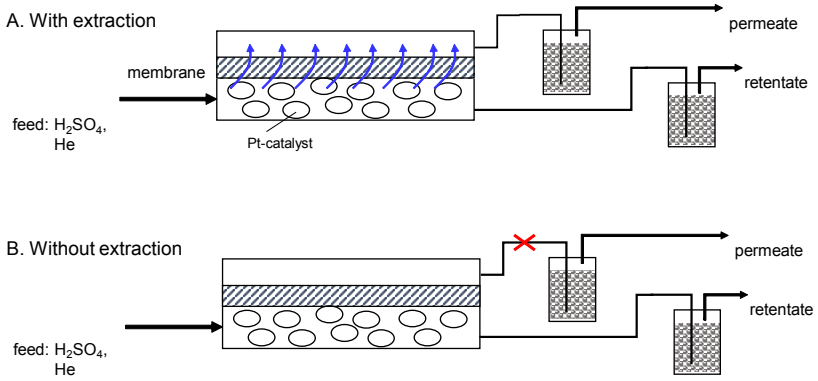

Fig. S4. Flow sheet of the membrane reactors with or without extraction for H_2SO_4 decomposition.

References.

1. W. Puthai, M. Kanezashi, H. Nagasawa, K. Wakamura, H. Ohnishi, T. Tsuru, *J. Membr. Sci*., 2016, **497**, 348-356.

2. X. Yu, L. Meng, H. Nagasawa, M. Kanezashi, M. Machida, T. Tsuru, *J. Amer. Cera. Soc*., 2019, **102**, 6946-6956.

3. J. Zhang, R. Zhang, X. Chen, M. Tong, W. Kang, S. Guo, Y. Zhou, J. Lu, *Ind. Eng. Chem. Res*., 2014, **53**, 6450-6456.

4. I. J. Dijs, R. de Koning, J. W. Geus, L. W. Jenneskens, *Phys. Chem. Chem. Phys.,* 2001, **3**, 4423-4429.

5. C. R. China, A. Hilonga, M. M. Maguta, S. S. Nyandoro, S. V. Kanth, G. C. Jayakumar, K. N. Njau, *SN Appl. Sciences,* 2019, **1**, 920.