Supplementary Material (ESI) for Chemical Communications

Electronic supplementary information for

Enzyme catalytic membrane based on a hybrid mesoporous membrane

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The following items have been included as supplementary material:

Characterization.

Fig. S1. Nitrogen adsorption-desorption isotherms and pore size distribution plots obtained using the calculated BJH model for the adsorption branch isotherm.

Fig. S2. Thermogravimetric curves for (a) GOD powder, (b) Hybrid mesoporous membrane after immobilized the APTMS and GA, and (c) Hybrid mesoporous membrane after immobilized the GOD.

Characterization.

N_2 adsorption/desorption isotherms were measured on a Micrometrics ASAP2010 instrument. The calcined hybrid mesoporous membrane was cut into small pieces which were put into the measurement cell. The weight loss of the samples upon heating was determined with a TGA apparatus (Thermoplus TG 8120, Rigaku.) in the temperature range of 25–1000 ºC, at a heating rate of 10 ºC $min^{-1}$and using air as the purge gas. SEM images were measured on a HITACHI-S4300. Complete etching of the alumina membrane was carried out using a 10-wt% phosphoric acid solution to obtain mesoporous silica formed inside the pores of the alumina membrane. The mesoporous silica was collected by filtration and used for observation of SEM images. TEM images were measured on a JEM-200EX (JEOL). The etching process is similar to that used for SEM. After etching, the solid product was washed by Mili-Q water three times and then separated by centrifugation. The activities of the immobilized enzyme were determined by an indicator reaction with peroxidase and 3,3',5,5'-tetramethylbenzidine and measured with a model V-570 spectrophotometer (JASCO) at 450 nm

The conversion efficiency defined in this work is the efficiency of catalytic conversion of glucose during passing through the GOD-M. We measured the amount of glucose remained in a sample solution after passing through the GOD-M. When the catalytic conversion of glucose occurs entirely within the GOD-M, glucose is absent in a sample solution after passing through the GOD-M, indicating the 100% conversion efficiency.

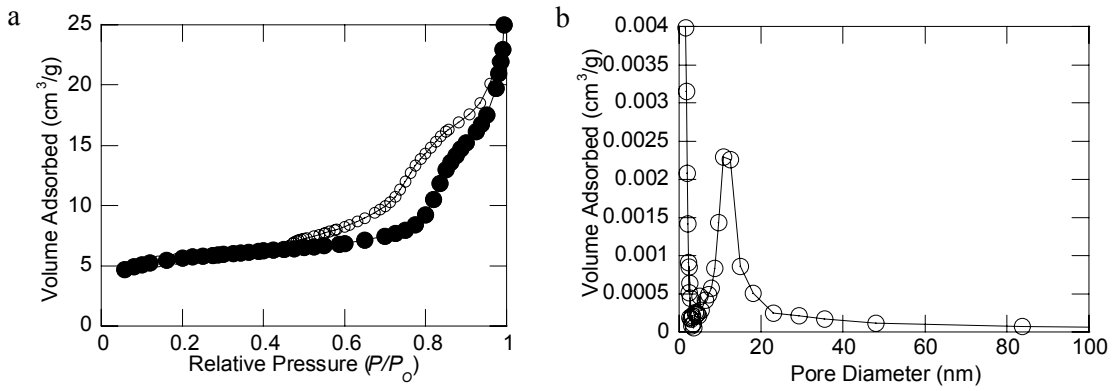

Fig. S1. Nitrogen adsorption-desorption isotherms (a) and pore size distribution plots (b) obtained using the calculated BJH model for the adsorption branch isotherm.

The Nitrogen adsorption curve (Fig S1) shows a substantial rise at P/P_0 close to 1. It

is due to the nitrogen adsorption at the alumina surface, because the isotherm of the alumina membrane itself shows substantial rise at P/P_0 close to 1 (the data was given in our previous paper, Nature Mater, 2004, ref. 13).

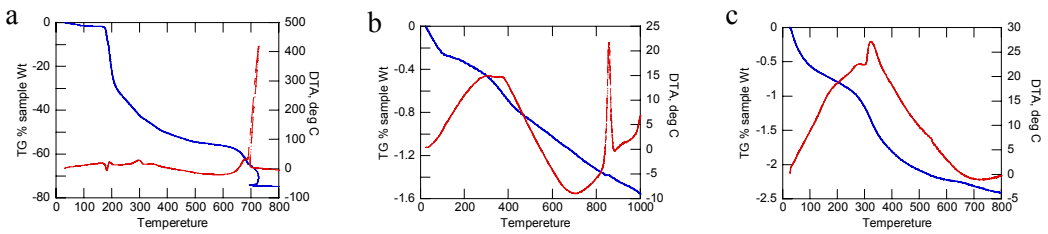

Fig. S2. Thermogravimetric curves for (a) GOD powder, (b) Hybrid mesoporous membrane after immobilized the APTMS and GA, and (c) Hybrid mesoporous membrane after immobilized the GOD.