Supplementary material (ESI) for Journal of Materials Chemistry

Supporting information

Synthesis of a b-oriented zeolite-coated fiber sensor: In order to prepare the zeolite-coated fiber optic sensor, a single mode optical fiber was cleaved at a right angle to its axis and cleaned with isopropanol in an ultrasonic bath. The synthesis solution was prepared by mixing 40 ml deionized (DI) water, 5.0 ml TPAOH solution (tetrapropyl ammonium hydroxide, 1M, Aldrich), 4.0 ml TEOS (tetraethyl orthosilicate, 98%, Acros), and 0.029 g sodium aluminate (>99%, Sigma). The mixture was stirred vigorously at 50°C for 10 hr to obtain a completely clear solution. Finally, 5.0 ml of the final synthesis solution was transferred into the synthesis reactor.

Hydrothermal synthesis was used to prepare the zeolite-coated optical fiber. The experiment was performed in a lab-designed autoclave as shown in Fig. 1S. The Teflon-lined stainless steel reactor had a chamber volume of ~10cm^3 and an inner diameter of 18 mm. The cleaved fiber endface, facing downwards, was placed 12–15 mm beneath the liquid surface. The synthesis reactor was then moved into an oven preheated to 180°C. In-situ hydrothermal synthesis was conducted at 180ºC for three hours. After synthesis, the zeolite-coated fiber end was rinsed with DI water and further cleaned in an ultrasonic bath for 5 min. After drying at 80°C for 10 hr, the zeolite film was activated by firing at 500°C in air for 3 hr with a heating and cooling rate of 1.0°C/min.

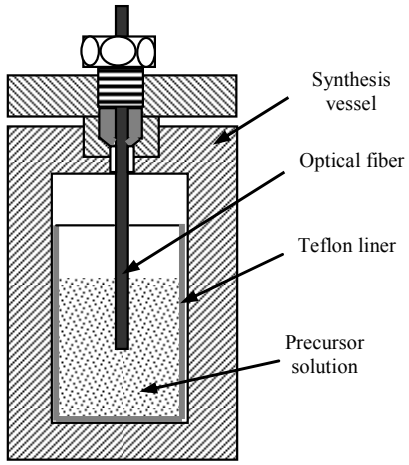

Figure 1S. Schematic diagram of an autoclave for coating zeolite onto an optical fiber surface.

Preparation of Ag-embedded, zeolite-coated fiber optic sensor: Ag^+ ions were loaded into the zeolite-coated thin film by ion-exchanging with 0.1M $AgNO_3$. After activating the zeolite-coated thin film, the fiber tip was equilibrated with 10.0 ml 0.1M $AgNO_3$ in the dark at room temperature for 24 hr. Then the fiber end was washed with deionized

(DI) water three times to remove the surface-adsorbed Ag^+ ions. Reduction of Ag^+-zeolite was carried out by immersing the zeolite-coated fiber end into a mixture of 0.1 M NaOH and 0.128 M formaldehyde. After the Ag^+ reduction, the fiber end was extensively washed with DI water to remove any unreacted formaldehyde and dried at 70ºC.