Supporting Information

Spherical Core-Shell Alumina Support Particles for Model Platinum Catalysts

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Characterization of the ERI zeolite

The powder XRD pattern of the as-synthesized product obtained after 14 days of crystallization at 100 °C is given in Figure S1. The XRD pattern corresponds to the calculated pattern for ERI structure type according to IZA Structure Commission.[1]
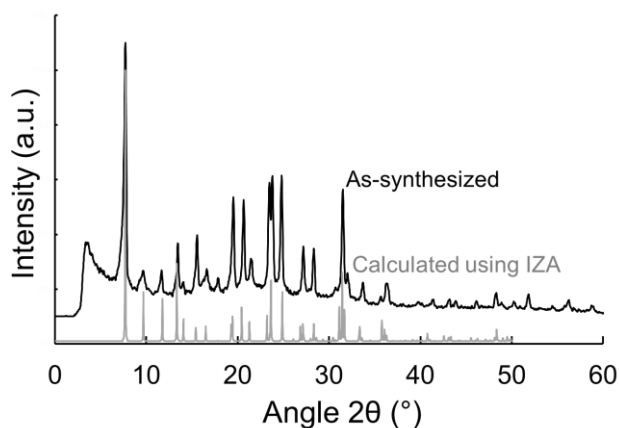

Fig. S1. XRD pattern of the as-synthesized erionite zeolite and the calculated pattern in the International Zeolite Association (IZA) tabulation.[1]

The ERI spheres are also characterized by nitrogen physiorption. The isotherm is a reversible Type I isotherm (shown in Fig S2) and proves the material contains micropores.[2] The BET surface area, calculated with the multipoint BET method using the adsorption data in the relative pressure range of 0.05-0.32, amounts to 468 m²/g.
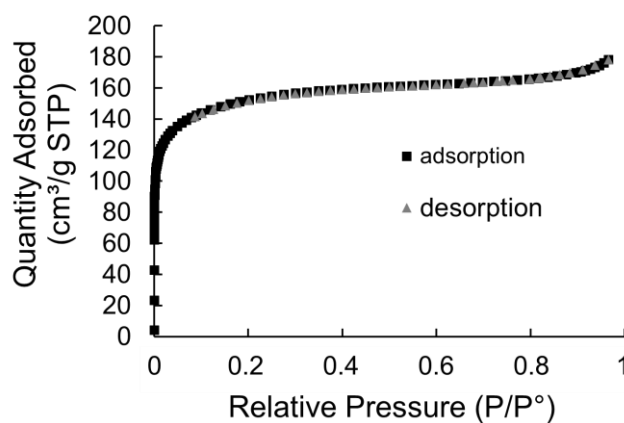

Fig. S2. a) Nitrogen adsorption-desorption isotherm of the erionite zeolite spheres after ammonium exchange and calcination at 550 °C.

Characterization of the alumina spheres

The estimated fractions of core and shell of the alumina particles using the STEM images were calculated by measuring the diameter of the core and the thickness of the shell, and then using geometrical calculations for the volume of perfect spheres.

$$Volume_{core} = \frac{4}{3}\pi r^3$$

$$Volume_{shell} = \frac{4}{3}\pi R^3 - \frac{4}{3}\pi r^3$$

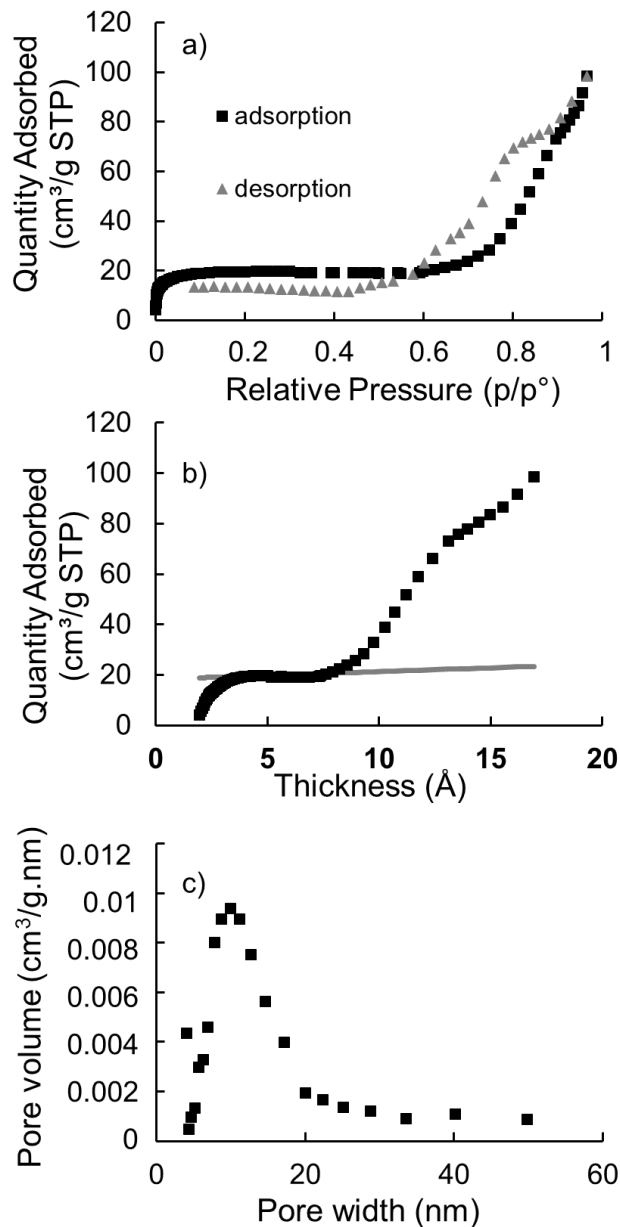where r is the radius of the inner core and R is the radius of the entire particle (core + shell).

Fig. S3. a) Nitrogen adsorption-desorption isotherm b) corresponding t-plot and c) BJH pore size distributions for the alumina spheres after calcination at 1000 °C. For the t-plot, the intercept of the lower linear curve represents the microporous volume. The nitrogen adsorption volume at the relative pressure of 0.967 was used to determine the total pore volume because no linear curve could be fitted in the high statistical thickness region. The pore size distribution was derived from the adsorption branch by using the BJH method and shows a broad size distribution of mesopores between 6 and 20 nm.

References

(1)   Baerlocher, C.; McCusker, L. B. Database of Zeolite Structures http://www.iza-structure.org/databases/.

(2)   Thommes, M.; Kaneko, K.; Neimark, A. V; Olivier, J. P.; Rodriguez-reinoso, F.; Rouquerol, J.; Sing, K. S. W. Physisorption of Gases , with Special Reference to the Evaluation of Surface Area and Pore Size Distribution (IUPAC Technical Report). *Pure Appl. Chem.* **2015**, *87* (9–10), 1051–1069.