Supplementary Information

Promotional Effect of Lanthana on High Temperature Thermal Stability of Pt/TiO_2 Sulfur Resistance Diesel Oxidation Catalyst

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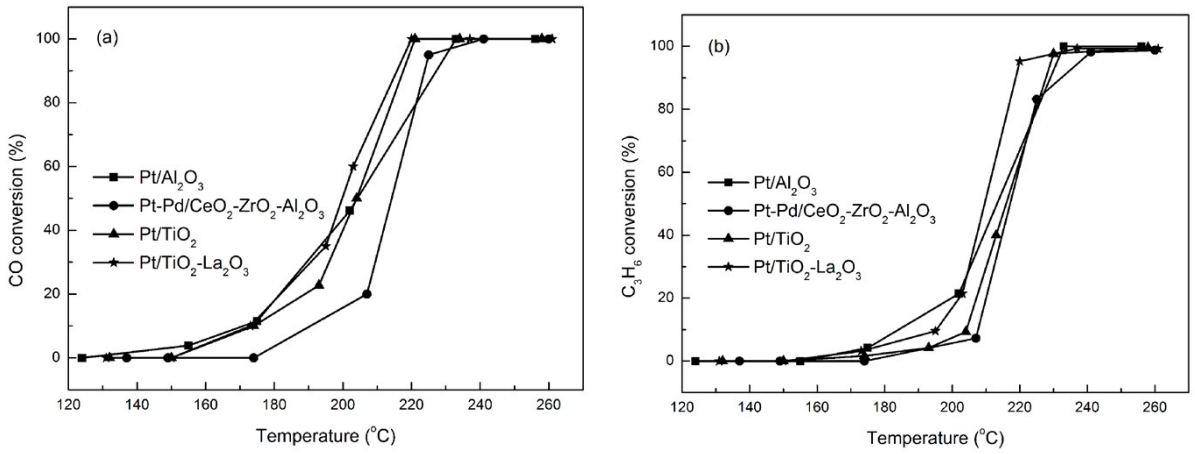

Fig. 1 The CO (a) and C_3H_6 (b) oxidation conversion over as-prepared Pt/TiO_2, Pt/TiO_2-La_2O_3 and commercial Pt/Al_2O_3, Pt-Pd/CeO_2-ZrO_2-Al_2O_3 catalysts

Reaction conditions: C_3H_6: 330 ppm, CO: 1000 ppm, NO: 200 ppm, O_2: 10%, CO_2: 8%, vapor: 7%, SO_2: 50 ppm, N_2: balance, GHSV = 60,000 h^{-1}. Commercial Pt/Al_2O_3, Pt-Pd/CeO_2-ZrO_2-Al_2O_3 DOC catalysts were supplied by Sichuan provincial vehicular exhaust gases abatement engineering technology center. All catalysts were pre-treated at 500 ^oC for 3h under the reaction atmosphere before running the performance test.

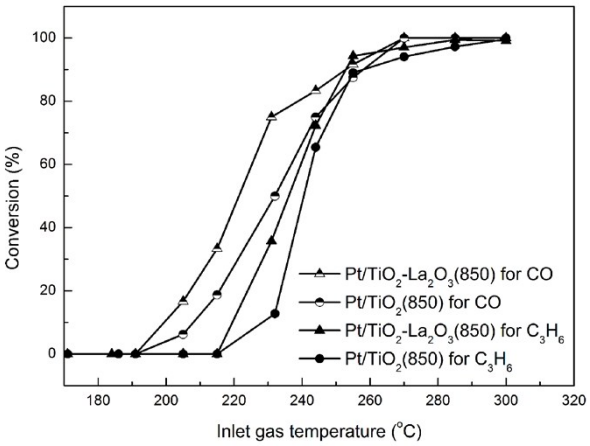

Fig. 2 The CO and C_3H_6 oxidation conversion over Pt/TiO_2(850) and Pt/TiO_2-La_2O_3 (850) catalysts

Reaction conditions: C_3H_6: 330 ppm, CO: 1000 ppm, NO: 200 ppm, O_2: 10%, CO_2: 8%, vapor: 7%, SO_2: 50 ppm, N_2: balance, GHSV = 60,000 h^{-1}. The Pt/TiO_2(850) and Pt/TiO_2-La_2O_3(850) catalysts were obtained by baking the fresh monolithic catalysts at 850 °C for 3h under the air. All catalysts were pre-treated at 500 °C for 3h under the reaction atmosphere before running the performance test.

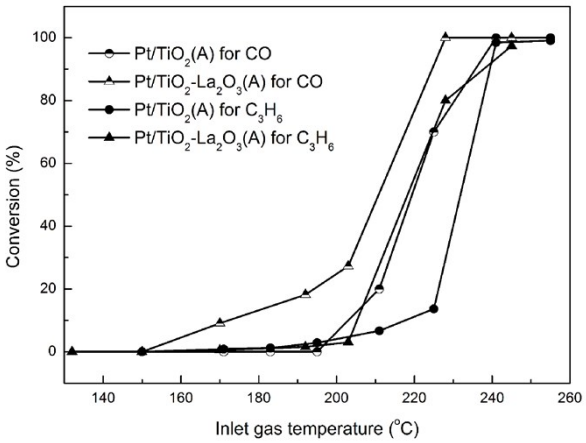

Fig. 3 The CO and C_3H_6 oxidation conversion over Pt/TiO_2(A) and Pt/TiO_2-La_2O_3 (A) catalysts

Reaction conditions: C_3H_6: 330 ppm, CO: 1000 ppm, NO: 200 ppm, O_2: 10%, CO_2: 8%, vapor: 7%, SO_2: 50 ppm, N_2: balance, GHSV = 60,000 h^{-1}. The simulative 160 000 km vehicle aged catalysts, Pt/TiO_2(A) and Pt/TiO_2-La_2O_3(A), obtained by following the reference [J. Andersson et. al., Appl. Catal. B: Environ., 72 (2007) 71-81]. The fresh monolithic catalysts were placed in the reactor and aged at 670 °C for 15 h and then at 250 °C for 15 h in the aging gases: 600 ppm C_3H_6, 1500 ppm CO, 200 ppm NO, 50 ppm SO_2, 5% O_2, 4% CO_2, 8% vapor, and N_2 balance at 800 mL/min flow rate. All catalysts were pre-treated at 500 °C for 3h under the reaction atmosphere before running the performance test.

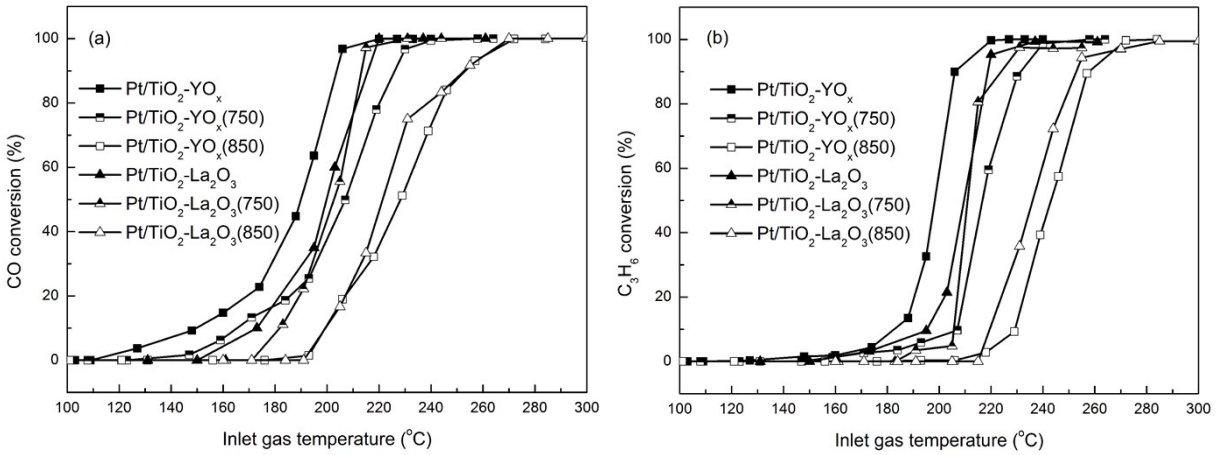

Fig. 4 The CO and C_3H_6 oxidation conversion over fresh and high temperature treated Pt/TiO_2-YO_x, Pt/TiO_2-La_2O_3 catalysts

Reaction conditions: C_3H_6: 330 ppm, CO: 1000 ppm, NO: 200 ppm, O_2: 10%, CO_2: 8%, vapor: 7%, SO_2: 50 ppm, N_2: balance, GHSV = 60,000 h^{-1}. The Pt/TiO_2-YO_x(750) and Pt/TiO_2-YO_x(850) catalysts were obtained by baking the fresh Pt/TiO_2-YO_x monolithic catalysts at 750 °C and 850 °C for 3h under the air, respectively. All catalysts were pre-treated at 500 °C for 3h under the reaction atmosphere before running the performance test.

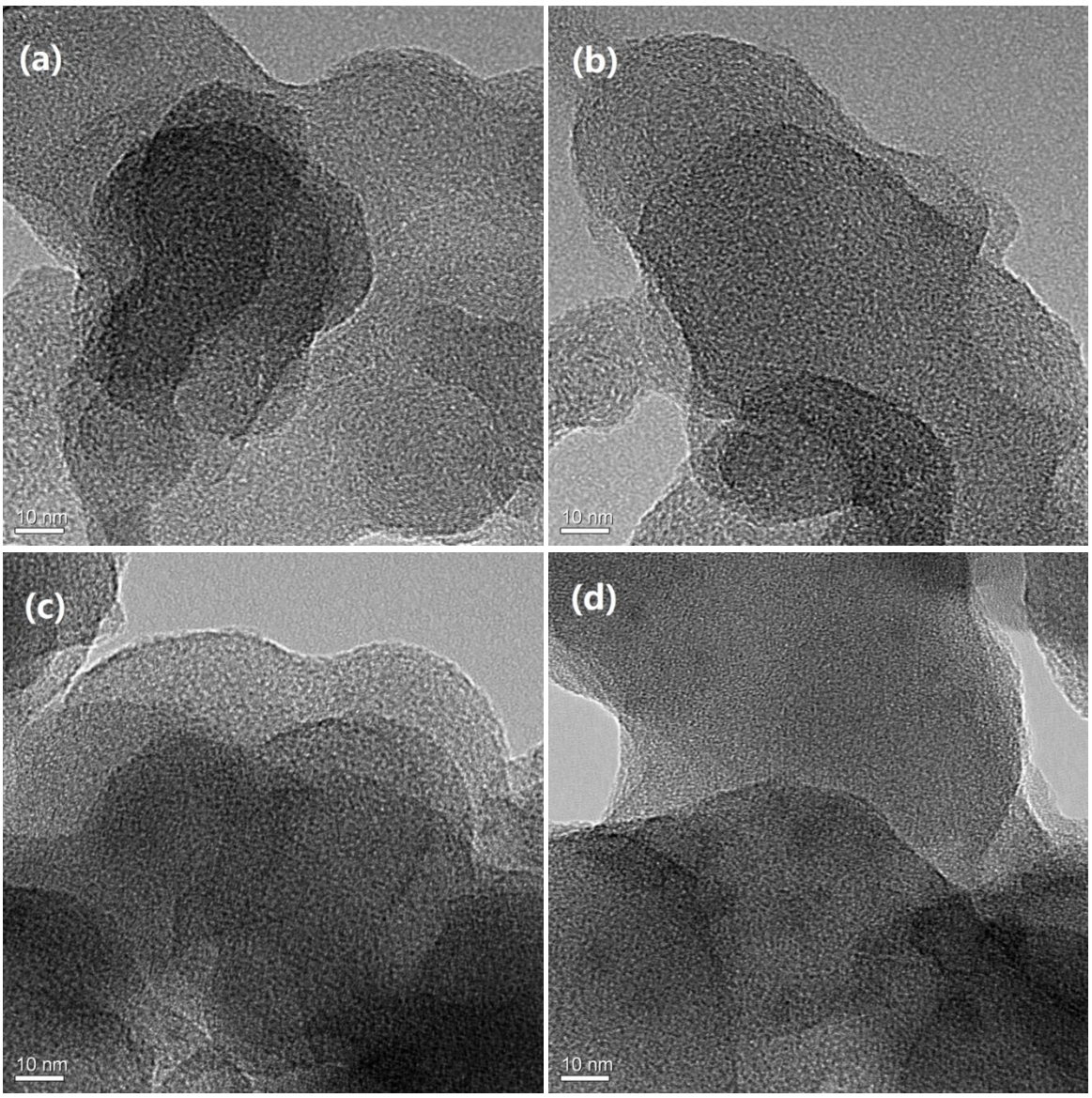

Fig. 5 TEM micrographs of the fresh Pt/TiO_2 (a)(b) and Pt/TiO_2-La_2O_3 (c)(d) catalysts

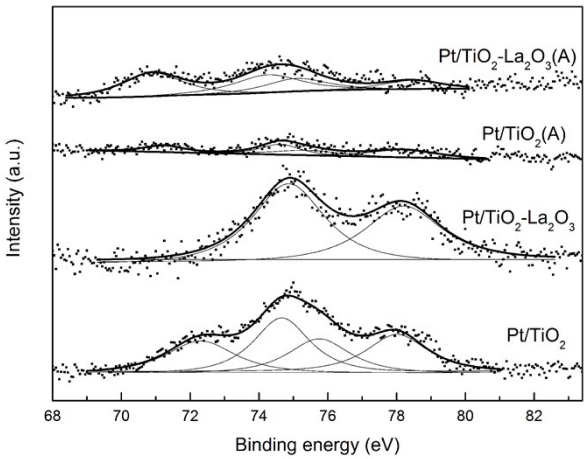

Fig. 6 XPS (Pt 4f) spectra of the Pt/TiO_2, Pt/TiO_2-La_2O_3, Pt/TiO_2(A) and Pt/TiO_2-La_2O_3(A) catalysts