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Development of Rh/Ce-Zr-La/Al2O3 TWCs' Wash Coat: Effect of Reactor on Catalytic and Thermal Stability

Authors : Su-Ning Wang, Yao-Qiang Chen

Abstract : The CeO2-ZrO2-La2O3-Al2O3 composite oxides are synthesized using co-precipitation method by two different reactors (i.e. continuous stirred-tank reactor and batch reactor), and the corresponding Rh-only three-way catalysts are obtained by wet-impregnation approach. The textural, structural, morphology and redox properties of the support materials, as well as the catalytic performance of the Rh-only catalyst are investigated systematically. The results reveal that the materials (CZLA-C) synthesized by continuous stirred-tank reactor have a better physic-chemical properties than the counterpart material (CZLA-B) prepared by batch reactor. After aging treatment at 1000 ℃ for 5 h, the BET surface area and pore volume of S1 reach up to 76 m2 g-1 and 0.36 mL/g, respectively, which is higher than that of S2. The XRD and Raman results demonstrate that a high structural stability is obtained by S1 because of the negligible lattice variation and the slight grain growth after aging treatment. The SEM and TEM images display that the morphology of S1 is assembled by many homogeneous primary nanoparticles (about 6.12 nm) that are connected to form mesoporous structure The TPR measurement shows that S1 possesses a higher reduction ability than S2. Compared with the catalyst supported on the CZLA-B, the as-prepared CZLA-C demonstrates an improved three-way catalytic activity both before and after aging treatment.

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