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THERMAL STABILITY AND SURFACE STRUCTURE OF SnO_2-CeO_2 IMPREGNATED CATALYSTS

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Abstract

Newly prepared SnO_2-CeO_2 catalyst samples used as depollution catalysts were characterized applying low-temperature nitrogen adsorption (BET), X-ray diffraction (XRD), thermo-gravimetry (TG-dTG) and temperature-programmed reduction (TPR) methods. Pure SnO_2 has higher surface area (17 m^2/g) than the pure CeO_2 (8 m^2/g). Addition of organic tin oxide precursor to ceria in amount of 5 wt% slightly decreases the surface area of CeO_2 ($S_{Sn5\text{-}Ce}$= 7 m^2/g). The increase of tin oxide content to 10 and 20 wt% increases the surface area of the catalyst ($S_{Sn10\text{-}Ce}$= 9 m^2/g; $S_{Sn20\text{-}Ce}$= 10 m^2/g). A similar effect was observed for pores of 1.7-300nm size. Catalyst sample Sn5-Ce exhibited the lowest pore volume, which increases with increasing the amount of tin oxide. Tin dioxide in Sn-Ce samples with lower loadings of SnO_2 (≤10 wt%) were well dispersed showing amorphous structure. High loading (20 wt%) of tin dioxide in Sn-Ce showed XRD lines of formation of cassiterate crystalline structure of SnO_2 without evidence of solid solution formation. In case of SnO_2 the TPR profile exhibits a major peak at about 545°C with much greater intensity than in case of CeO_2, revealing that SnO_2 was more easily reducible than CeO_2. Sn-Ce samples exhibit reducibility at lower temperatures (between 545-635°C) compared to the single tin dioxide (750°C).

Key words: crystalline structure, morphology, reducibility, SnO_2-CeO_2 impregnated samples

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