

Exploration of bulk-like/surface cerium sulfate species functionalization by the sulfation of SbVCT for NH₃-SCR

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Investigation of cerium sulfate species on sulfated SbVCT catalysts at various temperatures was carried out by diffused-reflectance infrared Fourier-transform spectroscopy (DRIFTS) analysis. The catalyst sulfated at a high temperature, SbVCT (500s-1) (i.e., sulfated at 500 °C), exhibited higher NO_x removal performance at low temperatures than the SbVCT (fresh) and VWTi catalysts. The in-situ DRIFTS results showed that the ionic character of SbVCT (500s-1) increased significantly, whereas SbVCT (250s-1) only had covalent character. For SbVCT (250s-1), a small amount of surface cerium sulfate species was formed. With increasing sulfation temperature, more cerium sulfate species formed as a bulk-like species, and its rate of formation increased. Surface cerium sulfate species formed at low temperatures underwent phase change to bulk-like species upon exposure to high temperatures. Catalysts containing bulk-like cerium sulfate species exhibit high SCR performance at low temperatures.

Keywords: SCR, SbVCT, NO_x removal, sulfation treatment, cerium sulfate