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Surface characterization of Co,K/La_2O_3 catalysts used for the catalytic combustion of diesel soot (Article)

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Abstract

Catalysts of Co,K/La_2O_3 have been prepared by wet impregnation. The samples have been calcined at 400 C and 700 °C and have been characterized for phase composition using x-ray diffraction and Fourier transform infrared spectroscopy. The XPS analysis of the samples has been obtained by examination of the O 1s, K 2p, C 1s and La 3d spectral regions. The XPS data are discussed with respect to the calcination temperatures and the soot combustion performed in the spectrometer reaction chamber. Analysis of the XPS data indicates considerable carbonation of the surfaces of all samples, even after burning the soot. The K/La_2O_3 solid presents the highest content of surface carbonated species, showing the highest catalytic activity for soot combustion. Interaction of the catalysts with CO_2 is studied by temperature-programmed desorption and microbalance experiments. Kinetic studies and surface characterization of the potassium-containing samples suggest that an appropriate surface potassium concentration is necessary for a synergetic action between potassium and lanthanum. In the cobalt-containing catalysts calcined at 700 °C, an increase is observed in the concentration of the outer-layer perovskite species when the potassium content increases, following the same tendency observed in the bulk. Such $LaCoO_3$ species would limit the reaction of lanthanum with CO_2. Copyright © 2003 John Wiley & Sons, Ltd.

Author keywords

Co,K/La_2O_3 catalysts; Soot combustion; XPS analysis

Indexed keywords

Engineering controlled terms: Calcination; Carbonation; Cobalt; Combustion; Exhaust gases; Fourier transform infrared spectroscopy; Impregnation; Phase composition; Soot; Temperature programmed desorption; Thermogravimetric analysis; X ray diffraction analysis; X ray photoelectron spectroscopy

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