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Enhanced properties of solid solution $(CeZr)O_2$ modified with metal oxides for catalytic oxidation of low-concentration methane☆

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Abstract

The solid solution $(CeZr)O_2$ catalyst was synthesized, and it was modified with metal oxides by incipient impregnation. Morphology and structure were characterized by X-ray diffraction, transmission electron microscope, nitrogen ad/desorption and H_2-temperature program reduction techniques. The catalytic properties of methane oxidation were also investigated. The results showed that solid solution possessed a mesoporous structure and exhibited excellent catalytic performance. The activity of solid solution was improved effectively by nickel doping, and the optimal loading is 15 wt%. The stability of $(CeZr)O_2$ and modified $(CeZr)O_2$ indicated that the structure of pristine solid solution played a key role in promoting molecules diffusion and spatial confining oxide particle sintering.

Keywords: Methane; Catalyst; Solid solution; Metal doping.

1. Introduction

With the depletion of fossil energy resources, the demand for new energy resources is growing.