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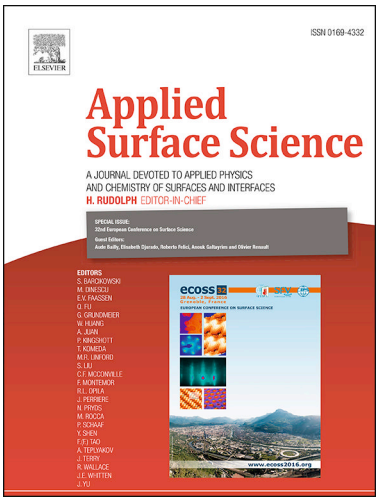

Full Length Article

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Enhanced performance of the CuO-ZnO-ZrO_2 catalyst for CO_2 hydrogenation to methanol by WO_3 modification

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Abstract

A series of WO_3 modified CuO-ZnO-ZrO_2 mixed oxides with different WO_3 contents (0~20 at.%) were prepared by co-precipitation method and used as catalyst for methanol synthesis from CO_2 hydrogenation. The effects of WO_3 content on the physicochemical and catalytic properties of the CuO-ZnO-ZrO_2-WO_3 catalysts were investigated by X-ray diffraction, X-ray photoelectron spectra, temperature-programed reduction of hydrogen, temperature-programed desorption of CO_2, N_2 adsorption and desorption, reactive N_2O adsorption, and activity testing. The results indicated that both CO_2 conversion and methanol selectivity of the CuO-ZnO-ZrO_2 catalyst was enhanced by the addition of small amounts (2 and 5 at.%) of WO_3. However, the activity was significantly decreased by the addition of excessive WO_3 (20 at.%). The activity was closely related to the specific surface area of metallic Cu (S_{Cu}), amount of weak basic sites, and reducibility of the catalyst.

Key words: CuO-ZnO-ZrO_2 catalyst; CO_2 hydrogenation; methanol synthesis; tungsten oxide

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