

The Role of Vanadia for the Selective Oxidation of Benzyl Alcohol over Heteropolymolybdate Supported Alumina Catalysts

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摘要 A series of 12-molybdophosphoric acid (MPA) supported on V₂O₅ dispersed γ-Al₂O₃ catalysts with different vanadia loadings were prepared by impregnation and characterized by N₂ adsorption-desorption, X-ray diffraction, temperature-programmed reduction, in situ laser Raman spectroscopy, UV-Vis diffused reflectance spectroscopy, scanning electron microscopy, and temperature-programmed desorption of NH₃ techniques. Their catalytic activities were evaluated for the vapor phase aerobic oxidation of benzyl alcohol. The catalysts exhibited high catalytic activity and the conversion of benzyl alcohol depended on the vanadia content while the catalyst with 15 wt% V₂O₅ content showed optimum activity. The characterization results suggest the presence of well-dispersed V₂O₅ and partially disintegrated Keggin ions of MPA on the support. In situ Raman studies showed a reduced Mo(IV) species when the catalysts were calcined at high temperatures. The high oxidation activity of the catalysts is related to the synergistic effect between MPA and V₂O₅.

关键词: molybdophosphoric acid vanadia alumina oxidation benzyl alcohol

Abstract: A series of 12-molybdophosphoric acid (MPA) supported on V₂O₅ dispersed γ-Al₂O₃ catalysts with different vanadia loadings were prepared by impregnation and characterized by N₂ adsorption-desorption, X-ray diffraction, temperature-programmed reduction, in situ laser Raman spectroscopy, UV-Vis diffused reflectance spectroscopy, scanning electron microscopy, and temperature-programmed desorption of NH₃ techniques. Their catalytic activities were evaluated for the vapor phase aerobic oxidation of benzyl alcohol. The catalysts exhibited high catalytic activity and the conversion of benzyl alcohol depended on the vanadia content while the catalyst with 15 wt% V₂O₅ content showed optimum activity. The characterization results suggest the presence of well-dispersed V₂O₅ and partially disintegrated Keggin ions of MPA on the support. In situ Raman studies showed a reduced Mo(IV) species when the catalysts were calcined at high temperatures. The high oxidation activity of the catalysts is related to the synergistic effect between MPA and V₂O₅.

Keywords: molybdophosphoric acid, vanadia, alumina, oxidation, benzyl alcohol

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