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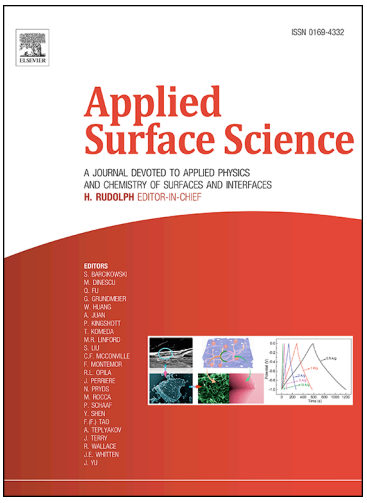

Full Length Article

New insight into alkali resistance and low temperature activation on vanadia-titania catalysts for selective catalytic reduction of NO

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New insight into alkali resistance and low temperature activation on vanadia-titania catalysts for selective catalytic reduction of NO

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Abstract

A series of vanadia-titania catalysts with different vanadia loadings for the selective catalytic reduction (SCR) of NO by ammonia was prepared via incipient impregnation method. The alkali resistance and SCR activity at low temperature has been investigated on the prepared catalysts. Increasing the vanadia loading from 1% to 10%, the NO removal efficiency of the catalysts gained a 70% growth at 200 °C. With the increase of the vanadia loading, the high loading vanadia-titania catalysts exhibited higher ratio of $V^{5+}/(V^{4+}+V^{5+})$, which enhanced the oxidation of NH_3 at high temperatures and also improved the standard SCR performance at low temperature. After doping with potassium, V_4/Ti catalyst (V_2O_5=4 wt%) displayed the best performance over which 80% initial activity was retained from 300 °C to 400 °C. More acid sites and active vanadium species were retained in the high loading vanadia-titania catalysts, which made them exhibit better low temperature alkali resistance. However, when vanadia content was higher than 4%, the competition of NH_3 oxidation severely deactivated the catalytic activity above 250 °C. Additionally, in the presence of SO_2 and H_2O the SCR performance of the high loading vanadia-titania catalysts were also studied in order to investigate the influence of the actual working conditions.

Keywords: Selective catalytic reduction; Vanadia; Alkali resistance; Acidity; NH_3 oxidation.

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