

Accepted Manuscript

Synergistic effect between the redox property and acidity on enhancing the low temperature NH_3 -SCR activity for NO_x removal over the $\text{Co}_{0.2}\text{Ce}_x\text{Mn}_{0.8-x}\text{Ti}_{10}$ ($x = 0-0.40$) oxides catalysts

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PII: S1385-8947(18)31445-1
DOI: <https://doi.org/10.1016/j.cej.2018.07.196>
Reference: CEJ 19594

To appear in: *Chemical Engineering Journal*

Received Date: 17 December 2017
Revised Date: 12 July 2018
Accepted Date: 29 July 2018

Please cite this article as: L. Chen, F. Yuan, Z. Li, X. Niu, Y. Zhu, Synergistic effect between the redox property and acidity on enhancing the low temperature NH_3 -SCR activity for NO_x removal over the $\text{Co}_{0.2}\text{Ce}_x\text{Mn}_{0.8-x}\text{Ti}_{10}$ ($x = 0-0.40$) oxides catalysts, *Chemical Engineering Journal* (2018), doi: <https://doi.org/10.1016/j.cej.2018.07.196>



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Synergistic effect between the redox property and acidity on enhancing the low temperature NH_3 -SCR activity for NO_x removal over the $\text{Co}_{0.2}\text{Ce}_x\text{Mn}_{0.8-x}\text{Ti}_{10}$ ($x = 0-0.40$) oxides catalysts

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Abstract: A series of $\text{Co}_{0.2}\text{Ce}_x\text{Mn}_{0.8-x}\text{Ti}_{10}$ ($x=0, 0.05, 0.15, 0.25, 0.35$ and 0.40) oxides catalysts were prepared by the sol-gel method and used for NH_3 -SCR. These catalysts were characterized by means of XRD, SEM-EDS, H_2 -TPR, NO/NH_3 oxidation, NH_3 (NO and SO_2)-TPD, XPS and *in situ* DRIFTS. It was found that the $\text{Co}_{0.2}\text{Ce}_{0.35}\text{Mn}_{0.45}\text{Ti}_{10}$ catalyst showed excellent NH_3 -SCR activity and a broaden temperature window ($180-390^\circ\text{C}$), accompanied with good resistance to SO_2 and H_2O . It could be concluded that the redox ability of $\text{Co}_{0.2}\text{Ce}_{0.35}\text{Mn}_{0.45}\text{Ti}_{10}$ could be reduced by Co and Ce doping, which resulted in high NH_3 -SCR activity at high temperature and good resistance of SO_2 . The addition of Co and Ce can supply more acid sites and NO_x adsorption sites over $\text{Co}_{0.2}\text{Ce}_{0.35}\text{Mn}_{0.45}\text{Ti}_{10}$. Thus, more surface Brønsted acid and Lewis acid sites, NO_x adsorption sites and modest redox ability of $\text{Co}_{0.2}\text{Ce}_{0.35}\text{Mn}_{0.45}\text{Ti}_{10}$ play key roles in the special NH_3 -SCR activity due to the interactions among Ce, Co, Mn and Ti oxides. Furthermore, the results of *in situ* DRIFTS study reveal the NH_3 -SCR reactions over $\text{Co}_{0.2}\text{Ce}_{0.35}\text{Mn}_{0.45}\text{Ti}_{10}$ and $\text{Co}_{0.2}\text{Mn}_{0.8}\text{Ti}_{10}$ catalysts are mainly controlled by E-R mechanism ($> 210^\circ\text{C}$) and the L-H mechanism ($< 210^\circ\text{C}$), respectively.

Keywords: Synergistic effect; $\text{Co}_{0.2}\text{Ce}_x\text{Mn}_{0.8-x}\text{Ti}_{10}$ oxides; SCR; redox; acidity

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