Synergistic effect between the redox property and acidity on enhancing the low temperature NH_3-SCR activity for NO_x removal over the $Co_{0.2}Ce_xMn_{0.8-x}Ti_{10}$ (x = 0-0.40) oxides catalysts

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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 $Co_{0.2}Ce_xMn_{0.8-x}Ti_{10}$ (x = 0-0.40) oxides catalysts

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Abstract: A series of $Co_{0.2}Ce_xMn_{0.8-x}Ti_{10}$ (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 suit* DRIFTS. It was found that the $Co_{0.2}Ce_{0.35}Mn_{0.45}Ti_{10}$ catalyst showed excellent NH_3-SCR activity and a broaden temperature window (180-390 ^oC), accompanied with good resistance to SO_2 and H_2O. It could be concluded that the redox ability of $Co_{0.2}Ce_{0.35}Mn_{0.45}Ti_{10}$ 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 $Co_{0.2}Ce_{0.35}Mn_{0.45}Ti_{10}$. Thus, more surface Brønsted acid and Lewis acid sites, NO_x adsorption sites and modest redox ability of $Co_{0.2}Ce_{0.35}Mn_{0.45}Ti_{10}$ 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 $Co_{0.2}Ce_{0.35}Mn_{0.45}Ti_{10}$ and $Co_{0.2}Mn_{0.8}Ti_{10}$ catalysts are mainly controlled by E-R mechanism (> 210 ^oC**)** and the L-H mechanism **(**< 210 ^oC**)**, respectively.

Keywords: Synergistic effect; $Co_{0.2}Ce_xMn_{0.8-x}Ti_{10}$ oxides; SCR; redox; acidity