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Alkali Metals as Promoters in Co-Mn-Al Mixed Oxide for N₂O Decomposition

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Catalytic decomposition of N₂O belongs to the Best Available Technologies for N₂O abatement from HNO₃ production. The aim of presented contribution is evaluation of alkali metals promoters effect in Co-Mn-Al mixed oxide (molar ratio Co:Mn:Al = 4:1:1) on the low temperature N₂O catalytic decomposition.

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Alkali promoted Co₄MnAlO_x mixed oxide (molar ratio of alkali metal/Co = 0.037) were prepared by impregnation of calcined Co-Mn-Al hydrotalcite (molar ratio Co:Mn:Al = 4:1:1) with an aqueous solution of Li, Na, K, Rb or Cs nitrate. The catalysts were characterized by XPS, TPR-H₂, TPD CO₂ and NH₃, SEM and tested for N₂O decomposition in inert gas and simulated waste gas from HNO₃ production.

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N₂O conversion over alkali promoted Co₄MnAlO_x mixed oxide decreased in order Cs > Rb > K > Na = Co₄MnAlO_x > Li in inert gas (Fig. 1) and was shifted to the lower values in the presence of typical components (NO_x, O₂ and H₂O) of flue gas. The addition of alkali promoters to the Co₄MnAlO_x mixed oxide resulted in a modification of both electronic properties of active metals and acid-base function of the catalyst surface. The promotional effect of alkali metals is connected with their ionization potential, the charge transfer to the catalyst and a decrease in binding energies of all catalyst components (Co, Mn, Al and O).

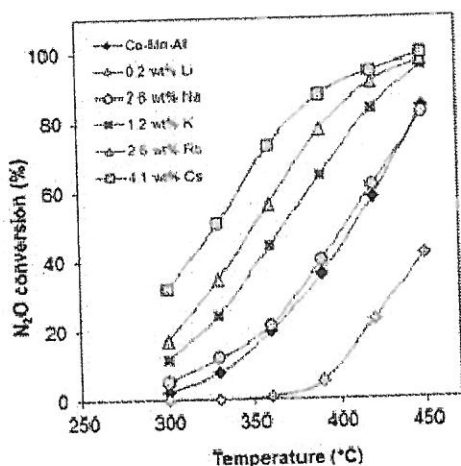


Fig. 1 Temperature dependence of N₂O conversion. Conditions: 0.1 mol% N₂O in He, WHSV = 60 l h⁻¹ g⁻¹

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