



Review

A review of selective catalytic reduction of nitrogen oxides with hydrogen and carbon monoxide

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ABSTRACT

The selective reduction of NO with hydrogen (H₂-SCR) and CO (CO-SCR) over platinum group metal catalysts in the presence of O₂ is overviewed. In the case of H₂-SCR, Pt and Pd show high activity at low temperatures. The acidity of the support material greatly affects NO reduction activity and selectivity to N₂/N₂O. Although the activity of Ir and Rh for H₂-SCR is low, coexisting SO₂ in the reaction gas considerably promotes NO reduction. The best support for Ir and Rh is SiO₂. Li and Zn additives improve the activity of Ir/SiO₂ and Rh/SiO₂, respectively, by maintaining the active reduced metal state. For CO-SCR, on the other hand, Ir is almost the only active metal species. Coexisting SO₂ is also essential for CO-SCR on Ir/SiO₂ to occur. The role of SO₂ for both H₂-SCR and CO-SCR on Ir/SiO₂ is to keep Ir in the form of the catalytically active Ir metal state. The additions of WO₃ and Nb₂O₅ considerably promote the activity of Ir/SiO₂ for CO-SCR, catalyzing CO-SCR even in the absence of SO₂. Ir metal interacting strongly with W oxide is the active species on WO₃-promoted Ir/SiO₂. Furthermore, the addition of Ba improves the performance of Ir/WO₃/SiO₂ catalyst.

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