

Supported DPNR catalysts for the simultaneous removal of NO_x and diesel particulate

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DPNR (Diesel Particulate-NO_x Removal) catalysts have been proposed to accomplish particulate (soot) and NO_x removal from diesel exhausts^[1]. Standard DPNR catalysts consist of precious metals and alkaline/alkaline-earth metal oxides dispersed on metal oxide supports such as alumina. In our study a homemade Pt-Ba/Al₂O₃ (1/20/100 w/w) catalyst, prepared by impregnation of γ -alumina with Pt and Ba salts, has been employed.

The aim of our work was to analyze the effects of the presence of soot on the behaviour of the DPNR catalyst in terms of NO_x storage/reduction and provide new insights on the role of stored NO_x in the soot combustion onto the catalytic surface. For this purpose, NO_x storage/reduction experiments have been performed by alternating fuel-lean and fuel-rich conditions (TRM, Transient Response Method) both in presence and in absence of soot. The stability/reactivity of the stored NO_x and the interaction between soot and the adsorbed species have also been investigated by Temperature Programmed Methods under inert flow (TPD) or in presence of oxygen (TPO), with and without soot.

All these experiments point out the complex interplay existing between soot and stored NO_x. The presence of soot decreases the storage capacity of the catalyst and has a destabilizing effect on the NO_x adsorbed species. There are also evidences of the stored NO_x participation in soot oxidation, by direct participation of the adsorbed species and/or the release of NO₂ and O₂ which actively oxidize soot^[2].

[1] A.L. Kustov, M. Makkee, Appl. Catal. B, 88 (2009) 263

[2] L. Castoldi, N. Artioli, R. Matarrese, L. Lietti, P. Forzatti, Catal. Today (2010), doi:10.1016/j.cattod.2010.03.022