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SUCCESSFUL USE OF ELECTROPOSITIVE PROMOTERS IN De-NO_x Pt-GROUP METALS CATALYTIC CHEMISTRY

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EXTENDED ABSTRACT

Recent studies of our research group have shown that the catalytic activity and selectivity of supported Pt-group metal catalysts can be remarkably increased by using electropositive promoters, such as alkali or alkaline earth metals.
Rate increases for reactions of high environmental significance, such as

$NO + C_3H_6 \ (+ O_2)$ to $CO_2 + N_2 + H_2O + N_2O$

$NO + CO \ (+ O_2)$ to $CO_2 + N_2 + N_2O$,

in the presence or absence of oxygen, by two orders of magnitude are typically achievable, while at the same time the selectivity towards N_2 is improved typically by 30-60 percentage units, thus approaching the absolute value of 100%, for conditions under which automotive three-way catalytic converters operate.

In this paper we present in a comparative manner all our recent experimental work upon these catalyst/reaction systems and we propose a general model which explains satisfactorily the mode of action of electropositive promoters on NO_x surface catalytic chemistry.

The results demonstrate that the insight obtained from these studies can be successfully used to the development of novel three-way catalyst formulations for the effective control of car emissions. These new catalytic materials are also significantly more economic compared with the currently used materials in three-way catalytic converters (TWCs).

Key words: TWCs, Platinum, Palladium, Propene, Promotion, Alkalis, Alkaline earths, Platinum group metals, De-NO_x chemistry, NO reduction.