

Phosphates: nickel (ni), and chromium (cr). chromium

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Phosphates: Zinc dialkyldithiophosphate (ZDDP) is an antiwear, antioxidant, and corrosion-inhibiting additive that is used in engine lubricating oils, hydraulic oils, and other lubricants. ZDDP is produced by first letting an alkyl or aryl alcohol react with phosphorous pentasulphide (P₂S₅), and then neutralizing the resultant acid with zinc oxide. 37 The phosphorus composition depends on many factors, such as the chemical composition of oil and oil additives, the age of the oil used, and conditions in the motor 38. Phosphorus contamination can be observed on the surface of catalytic converters as several different compounds. Secondly, phosphate compounds can also be formed directly with washcoat components. In that case, the resulting compounds are, for instance, aluminium and cerium phosphates. Poisoning by other compounds Automotive catalysts can also be deactivated by compounds commonly used in the structure of an engine. The , iron (Fe) is a poison for platinum group metals 39 .

Iron detected on the catalytic surface is often assumed to originate from the corrosion of metal components in the engine. Other similar impurities may be copper (Cu), nickel (Ni), and chromium (Cr). Chromium and nickel are added to the construction materials in order to improve the thermal stability of engines. Effects on PGM Precious metals have different types of resistance against poisoning.

Palladium is more sensitive than platinum and rhodium to chemical deactivation, in particular to poisoning by sulfur and lead 40, 41. Pd is easily oxidized at room temperature to PdO and it reduces to metallic Pd in the temperature range of 500°- 1200°C. At normal operation temperatures of

the catalytic converter, Rh is in the form of Rh_2O_3 , if the oxidation of Rh is kinetically favoured.

The oxygen content in the exhaust gas strongly affects the formation of Rh oxides; the higher the amount of oxygen, the higher the transition temperature is.