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Thermistors for Temperature Compensation of Titania Oxygen Sensor

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Various temperature compensators for TiO_2 air-fuel ratio sensors were investigated with particular attention to electric-resistance matching between compensator and oxygen sensor. Pentavalent dopants can change the electric conductivity of TiO_2 to different extents which can be determined by the difference between the radii of Ti[4+] and M[5+] ions. The ceramics of V_2O_5-doped TiO_2 and MgO-stabilized CoO exhibit favorable resistance matching with the TiO_2 sensor. Results have shown that these two compensation systems can provide a stable electric output signal which is a function of only the air-fuel ratio in the range of 350 ~ 850°C, with the effect of temperature on the TiO_2 A/F ratio sensor being minimized or even eliminated.

1. Introduction

For the purpose of environmental protection, very strict limits have recently been imposed on the concentration of CO, hydrocarbons and NO_x in the exhaust gas of automobiles and industrial kilns. The most effective solution to this problem is the use of catalytic converters in the exhaust system to promote the oxidation of CO and hydrocarbons to CO_2 and H_2O, respectively, and the reduction of NO_x to N_2. Since the conversion efficiency of this catalytic system varies as a function of the air-to-fuel (A/F) ratio, and the optimum conversion for all these toxic components can be simultaneously achieved only within a rather narrow A/F ratio range near stoichiometry,[1] investigation into systems for continuously monitoring the combustion condition in the neighborhood of the stoichiometric A/F ratio point by means of oxygen sensors has been initiated.[2]