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A Comparison between Ag/ZSM5 and Cu/ZSM5 Catalysts Coupled with Plasma in Hydrocarbon Catalytic Reduction of NOx at Low-Temperatures

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The temperature of exhaust gases in diesel engines usually fluctuates in the range of 100[°]400 °C; unfortunately, the performance of hydrocarbon selective catalytic reduction (HC-SCR) that is the most common technology to remove nitrogen oxides (NOx) is not satisfactory at low-temperatures. The temperature window for the HC-SCR can be expanded to a wider range by the combination with atmospheric-pressure plasma. In the present work, the HC-SCR of NOx has been investigated with a packed-bed dielectric barrier discharge (DBD) plasma reactor system in the temperature range up to 350 °C. The active metals such as silver (Ag) and copper (Cu) were supported on ZSM5 zeolite. Several hydrocarbons such as C2H4, C3H8 and C7H16 have been proposed as a reducing agent for the process. A comparison between Ag/ZSM5, Cu/ZSM5 and Ag-Cu/ZSM5 for the HC-SCR coupled with plasma has been made in terms of reaction temperature, NOx reduction efficiency, and hydrocarbon consumption, varying temperature increase rate to simulate fluctuating temperature of real exhaust gas. The experimental observations provide critical information on the practical applications of plasma-coupled HC-SCR over ZSM5-supported catalysts.

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