Comparison of NO_x adsorption/desorption behaviors over Pd/CeO_2 and Pd/SSZ-13

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A considerable amount of exhaust gas is discharged without adequate after-treatment during the cold-start period. The passive NO_x adsorber (PNA) system is attracting attention as a potential solution to the NO_x slip problem during the cold-start period. PNA is designed to store NO_x at low temperature, and to release them thermally after the downstream NO_x reduction catalysts are activated enough. Metal oxides or zeolites with precious metals have been widely studied as the PNA materials. It is worthwhile to compare metal oxide based PNAs and zeolite based PNAs that exhibit different NO_x adsorption/desorption behavior. Here, two typical PNA materials, Pd/CeO_2 and Pd/SSZ-13, were synthesized and compared. Cold-start NO_x adsorption and temperature programmed desorption experiments were carried out under different NO/NO_2 ratios which turned out that NO_x adsorption mechanisms on Pd/CeO_2 and Pd/SSZ-13 are completely different. Unlike Pd/SSZ-13, NO_2 facilitated NO adsorption in Pd/CeO_2. NOx is adsorbed on ceria surface and atomic Pd^{2+} sites in Pd/CeO_2 and Pd/SSZ-13, respectively.