

The development of the deactivation kinetics for Pd-based TWC

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The deactivation of commercial three-way catalyst (TWC) installed into gasoline driven automotive engine is apparent as the catalyst mileage increases. Although a variety of TWC deactivation model has been proposed to relate the decrease of the catalyst activity, the systematic study for developing the deactivation kinetics of TWC has been hardly reported with respect to the catalyst mileage and the metal content. Based upon the alteration of the active Pd metallic surface area, a simple deactivation kinetics has been developed to describe the decrease of the catalytic performance of the Pd-based commercial monolith TWCs with respect to the field-aged catalyst mileage from 4k to 98k miles. Particularly, the 2nd order deactivation kinetics developed in a form of the activity function well describes the general trend of the alteration of the TWC characteristics, particularly the Pd metallic surface area with respect to the catalyst mileage, regardless of the Pd metal content. The overall reaction kinetics incorporated with the activity function based upon the deactivation kinetics developed well predicts the deactivation of the TWC performance as a function of the catalyst mileage.