

The deactivation of the commercial TWC aged in vehicles

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Three-way catalyst (TWC) has been widely employed to reduce the air pollutants emitted from gasoline driven engines. However, there are still agenda to be improved, particularly the extension of the catalyst life to meet the current market demand. Since TWC converters are operated at considerably high exhaust temperature, the primary cause of the catalyst deactivation is attributed to the sintering of noble metals. In addition, the contaminants contained in engine lubricant and gasoline can seriously poison the catalyst. In the present study, the deactivation of the Pd based TWCs placed in warm-up catalytic converter (WCC) locating near engine has been particularly examined. As the catalyst mileage increased, the conversion of CO over the vehicle-aged TWCs seriously decreased, whereas the activity of the hydrocarbon oxidation was hardly altered. Both the degradation of the oxygen storage components and the sintering of the noble metal were regarded as the main causes of the overall catalyst deactivation. The physicochemical characteristics of the catalysts have been examined to elucidate the deactivation mechanism of TWC oxidation activity by XRD, XANES, XPS and TPR.