

Supplementary Information

Sulphation and ammonia regeneration of Pt/MnO_x-CeO₂/Al₂O₃
catalyst for NO_x-assisted soot oxidation

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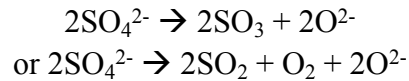
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(1) Calculation process of the sulphate amounts on the sulphated and regenerated samples.

The difference of mass loss between the sulphated/regenerated sample and the fresh one within the temperature range at 400 - 1100 °C in the TGA analyses in Fig. 7 was attributed mainly to the decomposition of sulphates. The decomposition followed the reaction of:



Hence, the amount of sulphates deposited on the samples was estimated roughly by the following equation.

$$m(\text{SO}_4^{2-}) = \frac{M(\text{SO}_4^{2-})}{M(\text{SO}_3)} \times m(\text{SO}_3)$$

where $m(\text{SO}_3)$: mass loss difference between the sulphated/regenerated sample and the fresh one at 400 – 1100 °C by the TG data in Table 3, $M(\text{SO}_4^{2-})$: relative mass of SO_4^{2-} = 96.06, and $M(\text{SO}_3)$: relative mass of SO_3 = 80.06.

(2) Calculation process of the overall Pt surface area per gram sample.

With the assumption that Pt particles were hemisphere shape on the support, the number of platinum particles on 1 g samples was calculated as:

$$n(Pt) = \frac{m(Pt)}{\rho(Pt)} / \left(\frac{2}{3} \pi R^3 \right)$$

where $m(Pt)$: mass of platinum in 1 g sample = 0.01 g, $\rho(Pt)$: density of platinum = $21.45 \text{ g}\cdot\text{cm}^{-3}$, R : average radius of platinum particles estimated from the TEM images.

The average surface area of each particles followed the equation of:

$$S_0 = 2\pi R^2$$

Hence, the overall Pt surface area per gram sample was:

$$\begin{aligned} S &= S_0 \times n(Pt) \\ &= \frac{3m}{\rho R} \\ &= \frac{1.4 \times 10^3 \text{ m}^3 \cdot \text{g}^{-1}}{R} \end{aligned}$$