

Deactivation Studies of NO Oxidation over Commercial Diesel Oxidation Catalyst by SO₂, H₂O, C₃H₆, Particulate Matter

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■ Introduction

Diesel oxidation catalysts (DOCs) and three-way catalysts (TWCs) are positively necessary for automobile after-treatment system. So, TWCs were researched various study of activity, characterization, deactivation, etc. However, DOCs were not enough. Specially, study of deactivation by sintering with aging time and poisoning were researched a little[1]. In this study, main reaction is NO oxidation for continuously regeneration trap (CRT) mechanism. At Diesel particulate filter (DPF) located at the back of DOCs, particulate matters (PM) are oxidized with using NO₂ from DOCs. In order to improve the supply enough NO₂ to DPF, it is necessary to study deactivation of DOC. In many factors of deactivation, how poisoning influences on deactivation was studied, and SO₂, H₂O, C₃H₆, PM are selected for poisoning materials[2,3].

■ Materials and Methods

The samples were prepared commercial diesel oxidation catalyst which is aged at various conditions. The aged temperature of aged was fixed at 250°C, 450°C, 650°C and aged time is vitiated 5, 10, 20, 50, 100 and atmosphere was H₂O, SO₂, C₃H₆.

Table 1. The history of aging

Aging gas	Aging temperature(°C)	Aging time(hr)	Inject type
Air+H ₂ O (5vol%)	250	5, 10, 20, 50, 100	Continuous Inject
	450	5, 10, 20, 50, 100	
	650	5, 10, 20, 50, 100	
Air+SO ₂ (50ppm)	250	5, 10, 20, 50, 100	Pulse Input · Air : 30 min · Air+SO ₂ / Air+C ₃ H ₆ : 20 min
	450	5, 10, 20, 50, 100	
	650	5, 10, 20, 50, 100	
Air+C ₃ H ₆ (200ppm)	250	5, 10, 20, 50, 100	

■ Results and disicussion

When H₂O was set as a poisoning material at 250°C aging temperature, NO conversion was decreased to 10h aging time. However, as aging time goes long, NO conversion

was increased because H₂O which was adsorbed at active sites of catalyst was evaporated and active sites were regenerated. At 450°C aging temperature the results was same after 5h aging time. At 650°C aging temperature, because active sites were lost by thermal factor, NO conversion was increased.

When SO₂ was set as a poisoning material at 250°C aging temperature, NO conversion was decreased to 10h aging time. However, after 10h, aluminum sulfates were generated at the surface of catalyst NO conversion was increased. At 450°C, because of interaction SO₂ poisoning and formation of aluminum sulfates, NO conversion was same with fresh catalyst. At 650°C, active sites were lost by thermal factors; it was difficult to confirm the effect of SO₂ poisoning

At the case of C₃H₆ poisoning, soot was formed by the reaction of air and C₃H₆, and NO conversion was decreased as aging time increased.

At the case of PM poisoning at 250°C, PM was poisoned at active sites. However at 450, 650°C, coke was converted to ash and fouling decreased NO conversion.

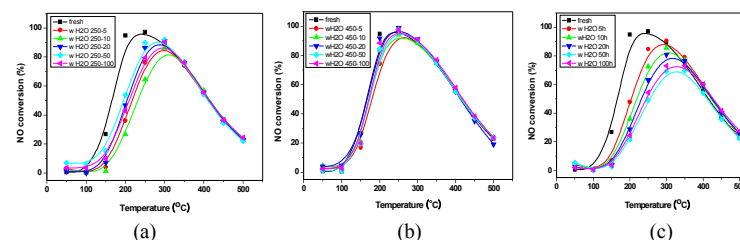


Figure 1. The results of NO oxidation with aging temperature (a) 250°C, (b) 450°C (c) 650°C

■ Significance

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■ Reference

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