

MICROWAVE IRRADIATION PROMOTING deNO_x CATALYST REACTION

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Introduction. Air pollution caused by nitrogen oxides within automobile emissions is serious problem. Among all, effective catalyzed technologies for lean burn and diesel engine have not developed yet since high quantity of remaining oxygen within emission inhibit catalyzed reaction. In this paper, microwave assisted deNO_x Catalyst Reaction [1] to selective catalyzed reduction (SCR) [2] is studied using propylene within unburned hydrocarbon of Diesel emission. By irradiating microwave at 2.45 GHz, temperature of deNO_x Catalyst reaction as low as that of emission is controlled.

Experiment. As catalyst, Cu-ZSM-5 is applied mixing with LaNiO₃, which is lossy material to microwaves thus absorbed them. Micro wave reactor made by quartz tube is set inside the applicator operated at 2.45 GHz. The temperature is measured using fluoro optical fiber thermosensor. Reactive gases are NO, O₂, C₃H₄, and He is the balanced gas. Total amount of gas flow is 60 ml/min. The generated gas is evaluated by NO_x analyzer and gas chromatograph.

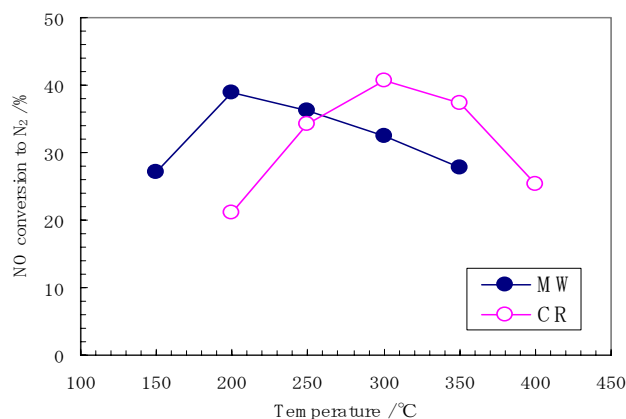


Fig. 1. The elimination of NO_x in 10% O₂ concentration.

Results. The elimination of NO_x in 10% O₂ concentration is shown in Fig. 1. It is found that the temperature of the maximum NO conversion to N₂ becomes 100 °C decreased when the microwave is irradiated. It is proved that microwave acts the decrease of the active temperature. Thus, the microwave irradiation is one of the best ways for promoting deNO_x catalyst reaction.

References

- [1] T. Kamei, N. Kikukawa and Y. Nikawa, "Microwave-Assisted De-NO_x Catalytic Reaction", Proceedings of the 2006 IEICE General Conference, C-2-102, p. 133 (2006).
- [2] H. Yahiro, and M. Iwamoto, "Copper ion-exchanged zeolite catalysts in deNO_x reaction", Appl. Catal. A, 222, 163–181 (2001).