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ABSTRACTS OF WORK-IN-PROGRESS POSTER PRESENTATIONS

THE COMBUSTION INSTITUTE
5001 BAUM BOULEVARD, SUITE 635, PITTSBURGH PA 15213-1851
PHONE: 412-687.1366
FAX: 412-687.0340
E-MAIL: office@combustioninstitute.org
WEBSITE: http://combustioninstitute.org

1 - 25-1357 - DEVELOPMENT OF RADICAL INJECTION DE-NO_x SYSTEM BY INTERMITTENT DIELECTRIC BARRIER DISCHARGE

S. Kambara [1], I. Nagao [2], K. Yukimura [2], T. Maruyama [3] and N.Meguri [4]
1)Idemitsu Kosan Co. Ltd., Coal Research Laboratories, Nakasode 3-1, Sodegaura, 299-0267, JAPAN
2)Department of Electrical Engineering, Faculty of Engineering, Doshisha University, 1-3,Tatara-Miyakodani, Kyotanabe, Kyoto, 610-0321, JAPAN
3)Department of Chemical Engineering, Graduate School of Engineering, Kyoto University, Kyoto 606-8501, JAPAN
4)Center for Coal Utilization, Japan, Roppongi 6-2-31, Minato-Ku, Tokyo, JAPAN, 106-0032

Current NOx reduction in coal-fired boilers has been reduced by two-stage combustion with low NOx burners and de-NOx equipments such as SCR. When a wide variety of coal is burned in the boiler, minimum NOx concentration at the boiler exit is more than 100 ppm, at SCR exit is usually more than 15 ppm. In the future, more less NOx and less cost are needed, it is important to develop advanced NOx reduction equipments.

In this study, new concept for NOx reduction using radical chain reaction is proposed. The plasma processes have attracted attention because of their low instrumental costs and simple process, where the plasma-induced radicals efficiently convert NOx into harmless gases such as N_2, O_2, and H_2O. Effective radical species for de-NOx, NH and NH_2 radicals, are produced by dielectric barrier discharge, and they are injected to flue gas. This paper describes fundamental research results about radical injection de-NOx experiments.

The dielectric barrier discharge was produced with an intermittent power source, of which repetition rate was 5-50 kHz and the output peak-to peak voltage of the power supply was 2-20 kV. The generated radicals were injected to simulation gas ($NO/O_2/N_2$). The dependence on the discharge power was measured by varying the repetition rate and applied voltage. The NO reduction was well correlated with the discharge power. The energy efficiency increased with decreasing discharge power. The maximum NOx reduction efficiency, 99.5%, was obtained at low NH_3/NO rate and the low discharge power. Discussions were also made on optimum gas flow and applied voltage for de-NOx and on the effect of the mixing of oxygen in ammonia gas.

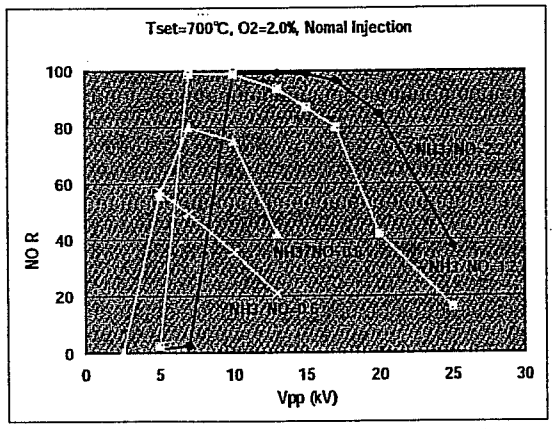

Figure 1. Results of NOx reduction tests by radical injection