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ABSTRACTS

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Progress in Radical Injection Techniques for Environmental Control

Shinji Kambara

Gifu University

Environmental and Renewable Energy Systems Division, 1-1 Yanagido, Gifu, 501-1193, Japan

The ammonia radical injection technique using pulsed DBD plasma has been studied to control efficient NO_x emission. In this method, NH_i radicals (NH₂, NH, and N) are generated by DBD plasma in the flow of an ammonia gas mixture, and are injected into a flue gas containing NO_x. The injected NH_i radicals react with the NO_x via an elementary chemical reaction, wherein NO_x is eventually converted to N₂ and NH₄NO₃. Since the discharge power is only used for exciting of the ammonia agent, the power consumption of the DBD plasma is extremely low. Hence, the DeNO_x process is substantially more energy efficient than other discharge technologies. Several DeNO_x parameters, including applied voltage, repetition rate, gas temperature, oxygen concentration, and molar mass ratios have been evaluated for the ammonia radical injection technique, and therein, the optimal conditions have been determined. A current study is to establish scale-up methodologies to expand as commercial equipment.

In this paper, some test results using the 50 m³/h bench scale plant are described. Characteristics of simultaneously removal of NO_x and SO_x by the ammonia radical injection are discussed.

Index Terms — Dielectric barrier discharge, nitrogen oxide, DeNO_x, ammonia, oxygen, radical injection.