

# NO<sub>x</sub> Removal by Electron Beam for Fine Dust Control

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The fine dusts are known to be harmful not only to humans and other living organisms but also to the environment where we live. Nitrogen oxides (NO<sub>x</sub>) plays an important role in the formation of fine dust in the air. NO<sub>x</sub> is one of main precursors of fine dust which secondly produced by photo-chemical reaction in the air. In 2016, Korea showed annual emissions of particulate matter (PM<sub>2.5</sub>) of 100,000 tons and nitrogen oxides (NO<sub>x</sub>) of 1,250,000 tons, respectively. This study intends to remove NO<sub>x</sub> by using the electron beam, which is one of the new technologies considered to be more efficient and economical than the other conventional treatment processes used for denitrification. The effects of chemical additive (NaOH and NH<sub>4</sub>OH), initial gas (NO and NO<sub>2</sub>) concentration, and absorbed dose on the removal of NO<sub>x</sub> by electron beam were evaluated. As a result, the conditions for maximum efficiency of NO<sub>x</sub> (NO and NO<sub>2</sub>) differed depending on the initial gas concentration, and their removal efficiencies were all above 94%. In most cases, NO<sub>x</sub> was removed better with lower initial NO<sub>x</sub> concentrations and higher absorbed doses of electron beam. As the irradiation strength (mA) of the electron beam increases, so does the probability of electron impact on the material, which may lead to increase the removal efficiency. The high-purity air, which is used as a background gas to dilute the concentration of target gases, produced NO<sub>2</sub> when the electron beam was irradiated. Conclusively, NO and NO<sub>2</sub> were effectively removed in the continuous electron beam process using additives. Furthermore, additional studies with samples similar to the actual emission components should be followed in order to apply the process at an on-site.

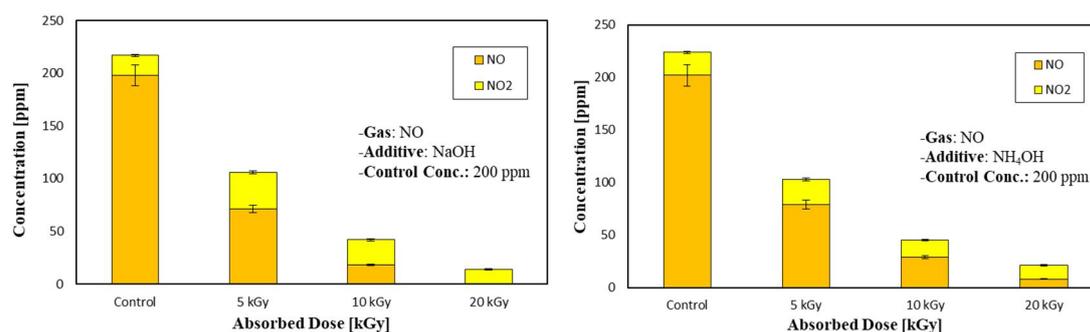


Fig. 1. Removal of NO<sub>x</sub> with single NO gas by electron beam and chemical additives (NaOH, NH<sub>4</sub>OH)

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