Fine particle removal from a corrosive gas using a two-stage electrostatic precipitator with multiple ion injection type chargers and parallel collection plates

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***Abstract*—A novel two-stage electrostatic precipitator (ESP) with multiple ion injection type chargers and parallel collection plates was developed and shown to efficiently collect particles from the corrosive waste gas discharged from semiconductor and optoelectronic processes. Carbon brush ionizers for the generation of ions were located outside of the main gas flow, but the injection of clean air and induced voltage between the outer and inner plates of the charging stage carried ions into the main gas flow; thus, gases and particles in the main flow did not corrode or contaminate the charger. The particle collection performance of the ESP was evaluated experimentally for 0.3 μm particles, PM (Particular matter) 1, and PM 2.5 by varying the application voltages to the charging stage, main gas flow rate, and distance between the carbon brush charger and main gas flow. The novel ESP achieved particle collection efficiencies of 89.5% and 99.5% at the best condition when the voltage was applied to only the charging stage and to both the charging and collection stages, respectively. The particle collection efficiencies of charging stage were characterized according to the corona discharge power and main flow rate based on Deutch's collection theory.**

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