Abstract Submitted
for the GEC20 Meeting of
The American Physical Society

Surface treatment of TiO_2 nano-powder using dielectric barrier discharges with rotatable electrodes NAW RUTHA PAW, TAKUMA KIMURA, TATSUO ISHIJIMA, YASUNORI TANAKA, YUSUKE NAKANO, YOSHIHIKO UESUGI, kanazawa University, SHIORI SUEYASU, SHU WATANABE, KEITARO NAKAMURA, , Research Center for Production Technology, Nisshin Seifun Group Inc., Fujimino, Japan — We have developed a dielectric barrier discharge reactor with rotatable electrodes for particulate material treatment. It contains a cylindrical reactor made from polyoxymethylene and thin plate electrodes attached on a rotatable axial rod installed in the reactor. Two outer electrodes were attached to be surrounded on the cylindrical reactor, which were connected to an ac power supply. AC peak to peak voltage was set at 30 kV. Air gas was supplied to the reactor at a flow rate of 1.5 slm. We found uniform discharge generation conditions on the inner surface of the reactor by adjusting rotation speed of the axial rod although applied ac high voltage was operated at 60 Hz. Surface treatment test was made for particulate material of 300 mg TiO_2 nano-powder Degussa P-25. Treated TiO_2 nano-powder was analyzed using XRD, XPS, and FTIR. XRD measurements showed that the peak theta positions shifted, which could be attributed to the substitution of new functional groups in the TiO_2 lattice. X-ray photoelectron spectra analysis indicated that the Ti 2p, O 1s peak shifted from a higher energy level to a lower energy level. The FTIR results indicated that hydroxyl groups significantly increased after 3 min DBD treatment.

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Date submitted: 16 Jun 2020 Electronic form version 1.4