Surface Dielectric Barrier Discharge for Powder Material Surface Treatment

Dong Chan Seok\textsuperscript{1}, Hyoen Young Jung\textsuperscript{2}, Yong Ho Jung\textsuperscript{1}, Seung Ryoel You\textsuperscript{1}

\textsuperscript{1}Plasma Technology Research Center (NFRI), Goonsan City, Rep. Korea
\textsuperscript{2}Kunsan National Univ., Goonsan City, Rep. Korea

We studied the characteristics of plasma generation of surface dielectric barrier discharge (sDBD) for solid powder surface treatment. As the sDBD electrode, one side of an alumina ceramic plate (1 mm thickness, 105 mm square) was covered the whole area of the plate by AgPd pasting and 1 mm width and 105 mm length of stripe shaped AgPd electrode was pasted on the other side. Applying high voltage between the two electrodes, we can make surface plasma on the ceramic surface of the stripe electrode side. The applied voltage and current signals were recorded which were used for the calculation of the energy consumption by plasma and for the measurement of the electrode capacitance while the plasma exists. He, Ar, N\textsubscript{2}, SF\textsubscript{6} gas was used for the plasma generation alternately and compared. Alumina powder of 0.01, 0.1 and 1 mm of particle diameter were loaded on the plasma generation area one by one and the same analysis processes were done as of no powder condition for each powder diameter. Ar and He gas discharge showed the lower root mean square (RMS) voltage of stiff rising of power consumption than that of without powder, on the contrary, N\textsubscript{2}, SF\textsubscript{6} gas discharge showed higher RMS voltage of stiff rising of power consumption without powder with some variation depending on the particle diameter. With this type of contact method between plasma and powder, PE and PTFE power was successfully treated to enhance the dispersion stability in water and NMP solution, respectively.

\textbf{Figure 1.} Single stripe sDBD discharge with helium gas (a) without powder, (b) with alumina powder (particle diameter: 1 mm)