

Silicon oxide deposition by atmospheric-pressure PECVD in a circulating fluidized bed reactor

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Silicon oxide deposition on fine alumina powders (100 μm) by plasma-enhanced chemical vapor deposition (PECVD) at atmospheric pressure was carried out in a circulating fluidized bed reactor (18 mm-ID \times 1000 mm-high). To deposit silicon oxide on alumina powders, a mixture of tetraethoxysilane (TEOS) and oxygen was used as the reactant gases and helium and argon gases were used as the dilute gases. The glow discharge was stable at the particle voidage below 5×10^{-3} inside the plasma electrode. The characteristics of the deposited film were analyzed by dynamic wicking meter, ATR-FTIR, XPS, SEM-EDS, and TEM. The plasma treated alumina exhibited a sharp decrease in water penetration. The chemical composition of the deposited film was similar to that of SiO_2 with increasing the flow rate ratio of O_2/TEOS . The silica content increased up to approximately 10wt% of the surface contents with increasing the treatment time and rf power(100-400W). In addition, the deposition efficiency was affected by the particle voidage inside the plasma electrode and the temperature of the reactor.