

Spark Plasma Sintered Aluminum Oxide Filter for Hot Gas Applications

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Abstract Id: **498** Submitted: **March 6, 2019** Event: **Conference for Undergraduate Research at FIU 2019**

Topic: **Engineering/Engineering Technology**

In this study, we report the fabrication of aluminum oxide filter via spark plasma sintering for application as a hot gas filter. Spherical alpha alumina particles were sieved to achieve uniform size distribution. A bimodal size distribution was observed, after sieving, of $180\pm 40\ \mu\text{m}$ and $109\pm 16\ \mu\text{m}$, for the large and small particle respectively. Powder was then sintered via spark plasma sintering at varying dwell temperatures, pressures, and dwell periods to find optimal parameters to produce sufficient surface diffusion at necks between particles. A temperature of 1500C, 30 minutes dwell period, and 10-20MPa applied pressure produced filters with optimal range of densification. Samples were then characterized by scanning electron microscopy (SEM) for porosity measurements and pore/neck formation between particles. A test rig to evaluate the filtering characteristics of Al₂O₃ filter is being developed. These tests will be conducted via inert gas flowed through quartz tube furnace at 600C.