One Step Thermal Processing of Multilayer Ceramic Membranes Improve Production Yields

Traditional ceramics have long been used to make durable structural materials. In the last decade ceramic membranes have opened up new fields and possibilities where the chemical, thermal, and electrical characteristics of novel ceramic materials are being exploited to perform a range of functions from the generation of electricity by solid oxide fuels cells to energy storage systems and gas separation.

The new generation of devices depends upon the ability to fabricate multilayer systems with tight control of characteristics like fired density, grain size, system porosity, and structural integrity.

Components formed through tape casting, pressing, extrusion and injection molding are now often assembled in their green state into multi-layer preforms with organic polymer matrices and microscopic topological features.

Thermal processing techniques for such devices have traditionally included multiple steps in several different pieces of equipment to provide de-bindering and then sintering. For thin fragile parts with large planar dimensions, the act of transport from one machine to another is often enough to create flaws and structural failures. In response users have reduced the size of thermal processing equipment, and moved through both de-bindering and sintering processes in small batches in order to maintain tight process control.
Keith Company has delivered shuttle and envelope kiln systems engineered to allow large scale processing of delicate components in a single machine. The new systems integrate de-bindering and sintering while ensuring the resulting effluent from the de-bindering is effectively processed through an integral thermal oxidizer. The typical system can utilize circulated preheated air flow and thermal oxidation of the effluent during the first stages of the process, and then become a tightly sealed electrically heated sintering chamber capable of uniformity tighter than +/- 5°F throughout the load pack. Large load capacities and the logistic advantages of the shuttle and envelope formats provide maximum production in minimum footprints and virtually zero turn-around times.

Parts with low green strength after de-bindering need not be handled, and our customers enjoy the advantages of accurate repeatable results in a machine with redundant systems to insure the successful completion of the processing cycle every time.

Charles H. Birks
Sales Manager