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High-Purity Alumina Refractory

Clay-free refractory formulations can greatly reduce—or even completely eliminate—contaminants within the refractory material.

A critical component of the high-temperature thermal processing of technical ceramics and powder metallurgy (PM) parts is a chemically pure, long-lasting refractory. Refractories typically encompass kiln or furnace hot-face linings, hearths, car decks, and, often most importantly, kiln furniture.

Impurities in the refractory may cause chemical contamination of the ware, which can be introduced directly from surface contact or from vaporization and condensation (especially in continuous processes such as tunnel kilns, roller hearth kilns or pusher furnaces). Impurities can also shorten the life of the refractory—particularly kiln furniture—and increase downtime by shortening the operating interval between service outages.

Clay-Free Refractory

To meet the needs of technical ceramics and powder metallurgy producers, Sunrock Ceramics Co. has developed material formulations that are completely free of clay. These clay-free formulations can greatly reduce—or even completely eliminate—contaminants within the refractory material.

The clay-free approach applies to both the pressed and cast formulations; clay-free thixotropic casting formulations were recently developed for the forming of more complex shapes. In addition, the purest available grades of raw materials are used, and the primary focus is on keeping out contaminants (including iron) throughout the entire production process.

Clay is a very useful raw material in the production of many refractory shapes, particularly kiln furniture, which is why it is so commonly used. Clay eases the forming process of pressing and casting, enhances green strength, improves densification, and lowers initial sintering temperatures by providing flux agents. However, clay is also a primary avenue for the introduction of impurities. It has become evident that the performance benefits of a clay-free product greatly outweigh the internal production considerations, especially for refractories used in severe applications.

To maximize the performance benefits of clay-free formulations, Sunrock fires its material to extremely high temperatures, which ensures the full formation of ceramic bonds and the virtual elimination of free silica. The elimination of free silica is particularly important in hydrogen atmosphere fir-



ing applications, because the hydrogen at high temperature reduces the silica out of the refractory and rapidly shortens the refractory's useful life.

Range of Options

The primary formulation is a 90% alumina-class material called HPA. The version of HPA developed specifically for pusher plates used in PM pusher furnaces is called HPA-CG, which is a very similar chemistry to HPA but has a different grain structure for the unique thermal shock loads and mechanical stresses of severe pusher furnace applications.

Also available are HPA-95, a 95% alumina body for high hot-strength applications, and HPA-99, a 99.55% alumina formulation for hydrogen atmosphere furnace linings and other specialized chemical inertness or very high-temperature applications. These formulations are also available in a fine grain composition for situations where surface finish or shape considerations warrant a fine grain mix.

To complement its range of high-alumina formulations, Sunrock offers a tooling portfolio to press hundreds of shapes. If a new shape is required and pressing is the desired forming process, the press design allows for very economical set-ups for new tooling. Thixotropic casting is also available for forming very complex shapes (also in a clay-free mix). ☎

For more information regarding high-alumina refractories, contact the author at (708) 344-7600 or dthurman@sunrockceramics.com, or visit www.sunrockceramics.com.