Textron Specialty Materials

Gaseous Nitradation

Objective

This industrial team is developing and demonstrating processing methods for the fabrication of low-cost ceramic composite tubes for use in commercial and industrial applications.

Materials and Processes

This processing approach uses silicon carbide reinforcing fibers in a silicon nitride-bonded silicon carbide matrix to fabricate tubular structures. These tubes may be coated or infiltrated using the Textron Rapid Densification™ process which enhances durability.

The reinforcing fibers selected by the team are silicon carbide monofilaments. Recently, silicon carbide yarns have also shown promise for this process.

Applications and Benefits

The ceramic composite tubes are targeted for a variety of industrial applications, particularly in metals melting and handling, furnace radiant heaters and combustion components for power generation. Applying ceramic composite tubes in aluminum melting/holding furnaces could save 50 trillion BTUs per year in energy usage.

Another potential application for these composite tubes is in an advanced ceramic ethylene production furnace for the chemical industry. The use of CFCC tubes in the advanced ceramic furnace is expected to increase ethylene production by 10%. This dramatic improvement can be realized through increased yield and prolonged furnace run-time.

Challenges

The primary challenges for this team are in the demonstration of process improvements and manufacturability, and validation of projected durability of components.

Team Members

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Textron's CFCC immersion heater tube for a molten aluminum holding furnace.

Team Contact

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CFCC

Continuous Fiber Ceramic Composite Program

A 10-year joint R&D effort initiated in 1992 to develop processing methods to produce reliable and cost-effective CFCC components for industrial applications.

CFCCs are light, strong, and corrosion-resistant materials capable of performing at high temperatures.

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