DuPont Lanxide Composites Inc.

Chemical Vapor Infiltration

CFCC

Objective

The team is developing functional and cost-effective CFCC components using the Chemical Vapor Infiltration (CVI) process. Incorporating these CFCC components into high-temperature heat-management and power generation applications will increase equipment efficiency and reduce pollution.

Materials and Processes

The CVI process involves fabricating ceramic fiber preforms in the shape of final parts. Fibers such as silicon carbide are woven, braided, and wound to produce the desired shape. These preforms are infiltrated with chemical vapors that react at elevated temperatures to form a silicon carbide matrix on and between the fibers. DuPont Lanxide operates commercial-scale CVI facilities capable of producing parts 4 feet in diameter and 7 feet in height.

The current program is focusing on fabrication, and testing and exposing CVI CFCC materials in simulated and real application conditions to prove their suitability for selected applications.

Applications and Benefits

Generating electric power at lower costs and with less environmental impact is vital to the nation's competitiveness. CFCC heat exchanger tubes that could withstand temperatures of 1260°C (2300°F) could increase energy conversion efficiency from the current 35% to 47%. Natural gas fired turbines with CFCC components, such as combustor liners and shrouds, could reduce environmental emissions by up to 25% and increase power output by several percent.

Porous radiant surface burners are used in various industrial applications for drying, curing, and process heating. Reverberatory screens fabricated from CFCC materials can boost thermal efficiencies from the current 30% to up to 60%. No materials, other than CFCCs, have been found that can survive such high temperatures, oxidation, and thermal cycling.

Challenges

The team must demonstrate long-term durability, life prediction capability, and cost effectiveness for their CFCC components to gain market acceptance. CFCC manufacturing development is needed to reduce costs and cycle time.

Team Members

DuPont Lanxide Composites Incorporated
Newark, DE

Alzeta Corporation
Santa Clara, CA

Foster Wheeler Development Corporation
Livingston, NJ

General Electric Power Systems
Schenectady, NY

Office of Industrial Technologies
Washington, DC

Solar Turbines, Incorporated
San Diego, CA

University of Hawaii
Honolulu, HI

Westinghouse Electric Corporation
Pittsburgh, PA

DuPont Lanxide Composites' "Enhanced SiC/SiC" Combustor Liners for Solar Turbine's gas turbine engine fabricated employing Chemical Vapor Infiltration.

Team Contact

Phillip Craig
DuPont Lanxide Composites Incorporated
1300 Marrows Road
P.O. Box 6077
Newark, DE 19714-6077
Phone: (302) 456-6577
Fax: (302) 456-6480
Email: craigpa@cdcux05.Lvs.dupont.com

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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