International Advanced Research Centre for Powder Metallurgy & New Materials (ARCI)

Balapur P.O., Hyderabad – 500005, Telangana, India

High porosity SiC foams as volumetric receivers for solar concentration technology

Overview

Cellular SiC ceramics are used as volumetric absorber in the generation of large amounts of electricity by concentrated solar power (CSP) technology because of their unique advantages of excellent mechanical, thermal, high temperature oxidation resistance and solar radiation absorption properties. SiC foam and honeycombs in CSP application can effectively absorbs the solar radiation and transfer the absorbed energy in terms of heat to the working fluid (usually air) which generates steam for spinning turbines in electricity generation. The operating temperature of working fluid can be increased to 1000°C or above by use of SiC based volumetric receivers. Presently, ARCI is actively pursuing R&D for development SiC honeycombs and foams with tuneable properties suiting for volumetric receiver.

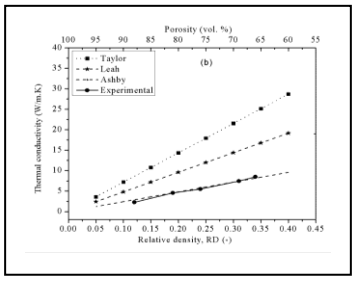
Key Features

- Capable of handling working fluid temperature up to 1200°C and high thermal conductivity.
- Tuneable permeability and mechanical properties due to the various foam configuration.
- Excellent optical properties (high absorptivity and moderate emissivity).
- Cost effective aqueous processing and scalable technology.

ARCI produced 10 PPI reticulated SiC foams

Potential Applications

- Volumetric solar receiver.
- Hot gas and molten metal filters.
- Light-weight substrates for optical applications.
- Molten metal filters.



Thermal conductivity comparison of SiC foams between experimental measurements and analytical predictions at 500°C.

Intellectual Property Development Indices (IPDI)

- Preliminary R&D shows encouraging results and laboratory scale samples are produced for properties evaluation.

Status	1	2	3	4	5	6	7	8	9	10

Major Publications

1. D. C. Jana, G. Sundararajan, K. Chattopadhyay, Effect of Porosity on Structure, Young's Modulus and Thermal Conductivity of SiC Foams by Direct Foaming and Gelcasting, *J. Am. Ceram. Soc.,* DOI: 10.1111/jace.14544.

Centre for Non-Oxide Ceramics (CNOC)
ARCI, Balapur PO., Hyderabad 500005, Telangana, India
Tel: +91 40 2445 2390 / 2445 2324; Fax : +91 40 2444 2699
Email: janad [at] arci [dot] res [dot] in / bpsaha [at] arci [dot] res [dot] in / royjohnson [at] arci [dot] res [dot] in