

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

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



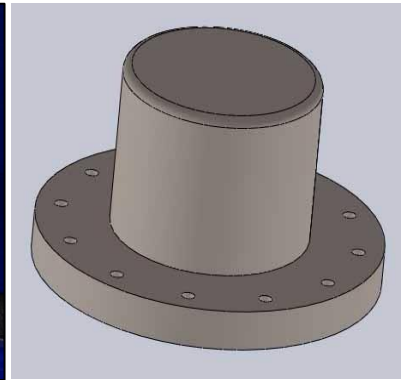
Aqueous based gel casting process for the development of near net shape non-oxide ceramic product

Overview

Gelcasting is considered as one of the most promising colloidal forming techniques for fabrication of near-net shape ceramic components. The process has been adapted to develop ceramic products having various sizes and shapes. This technique offers the advantages of machining intricate shape ceramic parts in green condition. Also, it is possible to tailor the properties of ceramics in terms of density, mechanical properties by tailoring the composition while formulation of the gelcasting batches. ARCI has developed SiC, Si₃N₄ and SiAlON products in prototype scale with the help of gel casting process and successfully sintered the products without any warpage or defect.

Key Features

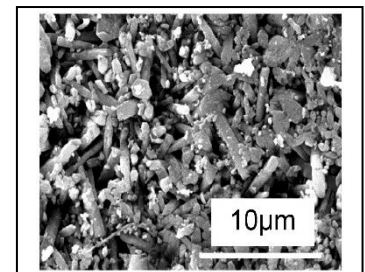
- Near-net processing of complex shapes.
- Green machining.
- Scalable to large size.
- Cost effective.



Non-oxide based green parts produced by gelcasting technique at ARCI

Potential Applications

- Non-oxide based crucibles for metallurgical industry.
- Electromagnetic windows.
- Cellular SiC product for solar receiver applications.



SEM micrographs of optimized SiAlON composition used in producing radomes prototype

Technology Readiness Level

- Up-scaling is in progress for large size products.

| IPDI* | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|------------|--|-------------------------------------|--|---|---|---|--|--|------------------------------|-----------------------------------|
| Activities | Basic concepts and understanding of underlying scientific principles | Short listing possible applications | Research to prove technical feasibility for targeted application | Coupon level testing in stimulated conditions | Check repeatability/consistency at coupon level | Prototype testing in real-life conditions | Check repeatability/consistency at prototype level | Reassessing feasibility (IP, competition technology, commercial) | Initiate technology transfer | Support in stabilizing production |
| Status | | | | | | | | | | |

Major Publications

1. P. Barick, D.C. Jana and B.P. Saha, Load-dependent indentation behaviour of β -SiAlON and α -Silicon carbide, *J. Adv. Ceram.* 2, (2013), 185-192.
2. D. C. Jana, G. Sundararajan and K. Chattopadhyay, Effect of monomers content in enhancing solid-state densification of silicon carbide ceramics by aqueous gelcasting and pressureless sintering, *Ceram. Inter.*, 43 (2017), 4852-4857.
3. K. M. Reddy and B. P. Saha, Microstructure-property correlation of porous β -SiAlON ceramics, *J. Alloy. Comp.*, 779 (2019), 590-598.

Centre for Solar Energy Materials (CSEM)

ARCI, Balapur PO., Hyderabad 500005, Telangana, India
Tel: +91 40 2445 2441 / 2445 2324; Fax: +91 40 2444 2699

Email: prasenjit [at] arci [dot] res [dot] in / bpsaha [at] arci [dot] res [dot] in / royjohnson [at] arci [dot] res [dot] in