

Sintering and sintering-free processing of ceramics and microstructural development

Overview

The course has two parts, part -1 deals with the fundamentals of sintering of ceramics and part – 2 involves discussion on synthesis and fabrication of advanced ceramics/ceramic components by a precursor route which is a powder-free and sintering-free approach. Sintering has been practiced as a processing approach for ceramics for centuries. However, the investigation of sintering as a scientific discipline is relatively new (about seventy years). This short course is intended to provide a snapshot of our current understanding of the phenomenon of sintering. It will focus on the following topics: *Physical description of sintering and grain growth including thermodynamics, mass transport and stages of sintering, Kinetics of sintering including models for the different stages, rheological models and phenomenological models, microstructure development: Pore-boundary interactions and grain growth during sintering, Viscous sintering, Solid-state sintering in ionic materials, Liquid phase sintering, Sintering practice including importance of green state processing for ceramics, and role of additives, heating rate and sintering atmosphere, master sintering curves and case studies.* In part – 2 of the course, the participants will be introduced to a novel powder-free, sinter-free approach to producing advanced ceramic materials. Synthesis and design of molecular precursors, predominantly Si-based preceramic polymers for the architectural & microstructural design of binary, ternary, quaternary and quinary ceramics for the achievement of specific properties will be the focus of this part of the course.

Dates for the Course	2nd January 2017 – 8th January 2017
Host Institute	IIT Madras
No. of Credits	1
Maximum No. of Participants	50
You Should Attend If...	<ul style="list-style-type: none"> ▪ You are from the industry interested in understanding the processing of advanced ceramics. ▪ You are a student or faculty member from an academic institution interested in the fundamentals of processing of ceramic materials.
Course Registration Fees	<p>The participation fees for taking the course is as follows: Student Participants: Rs.1000 Faculty Participants: Rs.2000 Government Research Organization Participants: Rs.3000 Industry Participants: Rs.5000 The above fee is towards participation in the course, course material, tutorials and assignments.</p> <p>Mode of payment: Demand draft in favour of “Registrar, IIT Madras” payable at Chennai The demand draft is to be sent to the Course Coordinator at the address given below.</p>
Accommodation	<p>The participants may be provided with hostel accommodation, depending on the availability, on payment basis. Request for hostel accommodation may be submitted through the link: http://hosteldine.iitm.ac.in/iitmhostel</p>

Course Faculty



Prof. Rajendra Bordia is currently chair of the Materials Science and Engineering Department at Clemson University in Clemson, SC, USA (since April 2013). He was a faculty member at the University of Washington (1991-2013) and a Research Scientist in DuPont Co. (1986 to 1991).

He received his B.Tech from IIT, Kanpur, India (1979), and his M.S. (1981) and Ph.D. (1986) from Cornell University, Ithaca, NY, USA. His research is at the intersection of materials and mechanics and is focused on fundamental and applied studies in the processing and properties of complex material systems for energy, environmental and medical applications. He is the author/coauthor of over 125 peer reviewed publications. Prof. Bordia is an Associate Editor of the Journal of the American Ceramic Society (1988-Present); Editor of the Journal of Ceramic Processing Research (1999-Present); and Editor-in-Chief of the Ceramics International Journal (2009 – Present). He has also served as technical advisor to two startup companies in the area of energy. He is a Fellow of the American Ceramic Society, Fellow of the Indian Institute of Metals and an Academician in the World Academy of Ceramics.



Dr. Ravi Kumar N V is an associate professor in the Dept of Metallurgical & Materials Engineering, Indian Institute of Technology-Madras (IIT Madras) and he has been with IIT Madras since 2007. He received his B.E in mechanical

engineering from the Bangalore University in 1996, M.Sc (engg) in metallurgy from IISc, Bangalore in 2000 and doctorate degree in materials science from the Max Planck Institute, Stuttgart, Germany in 2004. After obtaining his doctorate degree, he continued in the same institute as a guest scientist till 2006. Prior to joining IIT Madras, he worked for a brief period in the Institute for Shock Physics, Pullman, USA in 2006. His research interests include processing & characterization of structural and functional ceramic materials, bioadhesion & biomimetics. He is on the editorial board of the journal Surface Innovations.

Course Coordinator

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