

# Polymer Derived Ceramics (PDC) Technology: Basics and applications as coatings, ceramic fibres and composites

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## Overview

The course has three parts: part -1 deals with the basics of polymer derived ceramics technology, part – 2 involves the processing of polymer and ceramic coatings, ceramic fibres, composites and catalytically active ceramics, part – 3 involves discussion on the mechanical stability/interfacial stability of ceramic coatings.



This course first delivers a comprehensive overview about PDC technology as an alternative processing approach for advanced ceramics. The PDC technology is relatively new scientific discipline (only 50 years) in comparison to the classic powder technology for manufacturing of ceramics. So, this short course is intended to demonstrate the potential and advantages over the classic ceramic manufacturing techniques and provides the state-of-the-art of the current understanding. This part will focus on tailoring the preceramic polymers and their characterization, various stages of polymer to ceramic conversion as well as microstructural characterization and evaluation of the ceramic properties. In the next part of the course, most common applications of the PDC technology will be introduced to the participants. On one hand the polymeric nature of the precursor provides a very flexible processing techniques akin to that of plastics, On the other hand, the biggest disadvantage of the PDCs is the strong shrinkage during pyrolysis, which avoids the processing of bigger, dense ceramic parts. Therefore, reasonable application of precursors for the processing of polymer and ceramic coatings, ceramic fibers, composites and catalytic active ceramics will be the focus of this part of the course. This will be followed by lectures on the mechanical stability/interfacial stability of ceramic coatings and ceramic matrix composites.

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| <b>Modules</b>                 | <b>A: Basics of PDC technology</b><br><b>B: Processing of polymer and ceramic coatings, fibres, composites and catalytic active ceramics</b><br><b>C: Mechanical stability/interfacial stability of ceramic coatings</b><br><b>Number of participants for the course will be limited to fifty.</b><br><b>Course Duration: November 21 – November 28, 2022 ; 1 week</b>  |
| <b>You Should Attend If...</b> | <ul style="list-style-type: none"><li>▪ You are from the industry interested in understanding the processing of advanced ceramics through polymer derived ceramics (PDC) technology</li><li>▪ You are a student or faculty member from an academic institution interested in the fundamentals of processing, characterization, and applications of PDCs</li><li>▪ You are a scientist or researcher from Govt. organisation/R &amp; D labs, start-ups interested in staying abreast with the current state-of-the art and understand the prospects of translational research in PDC</li></ul> |
| <b>Accommodation</b>           | The participants may be provided with hostel accommodation, depending on availability, on payment basis. Request for hostel accommodation may be submitted through the link: <a href="http://hosteldine.iitm.ac.in/iitmhostel/">http://hosteldine.iitm.ac.in/iitmhostel/</a>  |

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| <b>Fees</b> | <p>The participation fees for taking the course is as follows:<br/> <b>Student Participants:</b> Rs.1000<br/> <b>Faculty Participants:</b> Rs.2000<br/> <b>Government Research Organization Participants:</b> Rs.3000<br/> <b>Industry Participants:</b> Rs.5000</p> <p>The above fees include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility.</p> <p><b>Modes of payment:</b><br/> <u>Online transfer:</u><br/> Click here to pay: <a href="https://elearn.nptel.ac.in/gian/">https://elearn.nptel.ac.in/gian/</a></p> |
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| <b>Registration Procedure</b> | <p>Please follow the following steps for the registration:</p> <ol style="list-style-type: none"> <li>1. Go to GIAN website (<a href="http://www.gian.iitkgp.ac.in/GREGN/index">http://www.gian.iitkgp.ac.in/GREGN/index</a>) First time users need to register and pay a one-time fee of INR 500 /</li> <li>2. Enroll for the course: <b>Polymer Derived Ceramics (PDC) Technology: Basics and applications as coatings, ceramic fibres and composites.</b> Once you enroll for the course, an Enrollment/Application number will be generated, and the course coordinators will be notified.</li> </ol> |
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## The Faculty

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|   | <p><b>PD Dr. rer. nat. habil. Günter Motz</b> is at University of Bayreuth as senior scientist since 1996. Currently he is an Assistant Professor at the Chair of Ceramic Materials Engineering at the Faculty of Engineering Science at University of Bayreuth, Germany (since 2011), and Associate Professor at the Federal University of Santa Catarina in Florianópolis, Brazil (since 2013). He also worked as a consultant for Clariant AG (2007-2010), BioCer GmbH (2000-2007), and Fraunhofer Society (2011-2013). He received his diploma in chemistry in 1989 from University of Leipzig, Germany (1989) and Ph.D. (1995) from University of Stuttgart, Germany. His research is at the intersection of materials science and chemistry focused on fundamental research on the synthesis of new preceramic SiCN-based ceramics and correlation between architecture of the precursor and the properties of the resulting ceramics for potential industrial applications. He is an author/co-author of more than 130 peer-reviewed publications and patents, he presented 65 invited or keynote lectures, and was the supervisor of 18 Ph.D. students. He is a member of the American Ceramic Society (ACerS) as well as of the German Ceramic Society (DKG) via the chair. He acts as a reviewer for DFG, NSF, ANR, Industry, and is associate editor of the journals Materials, Coatings, Nanomaterials and Nanotechnology, and Frontiers in Materials</p> |
|  | <p><b>Prof. Ravi Kumar N V</b> is a Professor and HoD in the Dept of Metallurgical &amp; 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 &amp; characterization of structural and functional ceramic materials for strategic sectors, energy and environmental applications. He is on the editorial board of the Surface Innovations (Editor), Advances in Materials Science and Engineering (Associate Editor), Frontiers in Materials: For ceramics &amp; glass: (Review Editor)</p>  |

### Course Co-ordinator

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<http://www.gian.iitkgp.ac.in/GREGN>