Physics and Technology of Functional Materials–176020B05

February 12th to 20th 2018 at Anna University, Chennai

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Overview

New functional materials are essentials for technological innovation. In this course, the main classes of functional materials will be discussed in view of advanced applications. The course will essentially deal with crystalline materials and with the techniques used to prepare them as bulk single crystals, thin films or nanostructures. The participants will acquire information about modern crystal growth and epitaxial methods. Case materials will additionally be discussed separately as examples of optimal crystal growth processes. The lectures will be integrated by some practical experiments carried out Crystal Growth Centre, Anna University.

Duration Course Code & Venue	**12th February 2018–20th February 2018(26 hrs. of lectures and 2 practical laboratories)** **Course Code: [176020B05]** **Venue Crystal Growth Centre, Anna Number of participants for the course will be limited to hundred.**
Modules	• Introduction, materials for key technologies, difference between natural and synthetic crystals, requirements of synthetic crystals for high-tech. • Definition of crystal growth and its thermodynamic and kinetic aspects • Nucleation and shape of crystals • Overview of crystal growth techniques for bulk crystals, phenomenology of crystal growth, mass and heat transport • Flowdynamic, concept of boundary layer, segregation and doping profiles, constitutional supercooling in melt growth • Overview of epitaxial techniques, with focus on MBE and VPE • Homo- and hetero-epitaxy, pseudomorphic structure, concept of strain engineering • Dimension of the crystal as a degree of freedom for tailoring the properties, preparation of 2D, 1D and 0D nanostructures • Perfection of real crystals, extended and point defects, methods for preventing defect formation, “useful” defects • Case processes for technologically-important materials; special focus on wide band-gap semiconductors (nitrides, SiC, sesquioxides) for power electronics and UV optoelectronics.
You Should Attend If…	▪ You are a student (B.Tech/M.Sc/M.Tech/PhD), a post-doctoral fellow ▪ Faculty from reputed academic institutions and technical institutions. ▪ The participation of executives, engineers, and researchers from manufacturing, service and government organizationsincluding R&D laboratories is also strongly encouraged.
Fees	The participation fees for taking the course is as follows: **Participants from abroad : US $500** **Industry/ Research Organizations: Rs. 5000** **Academic Institutions: Rs. 2000 (Faculty) 1000 (Research Scholars/PG and UG Students)** The above fee includes all instructional materials. The participants will have to take care of their travel, accommodation and food.

The Faculty

Dr. Roberto Fornari graduated in Physics with honours in 1980. From 2013 he is Professor of Physics at the University of Parma (Italy), where he coordinatesthe Physical Unit of the Dept. Mathematical, Physical and Computer Sciences. He was earlier at the Institute for Electronic and Magnetic Materials of the National Research Council (1981 to 2003). From 2003 to 2013 he was the Director of the Leibniz Institute for Crystal Growth (IKZ) and Full Professor at the Institute of Physics of the Humboldt University, Berlin. His research focused on:bulk and epitaxial semiconductors for advanced applications(GaAs, InP, GaN, AlN and InGaN),novel perovskites, piezo-electric oxides, semiconducting oxides, solar silicon, silicon nano-structures.Presently he coordinatesa project on gallium oxide and related alloys for power electronics and UV-detectors.

Dr. Fornarihas published 220 articles, of which 160 in international journals and 60 in conference proceedings. He has written12 book chapters and invited reviews and isthe holder of ten patents.He has delivered 50 invited and plenary talks at international conferences, and has edited severalbooks and conference proceedings. Presently he is the associate editor of J. Crystal Growth, Crystal Research and Technology, J. Optoelectronics and Advanced Materials. Dr. Fornari has chaired13 international conferences and 4 schools and served on theProgramme/Advisory Committee of over 60 international congresses. He has been IOCG Vice-President (2007-10), President (2010-16); Chair of IUCR Commission on Crystal Growth (1999-2005); Member Executive Committee E-MRS (2011-17).He is recipient of the PremioMammi 2017 of the Italian Crystallographic Association (AIC).

Dr.J.Kumar is the Director of Planning & Development and Professor of Crystal Growth Centre, Anna University. His area of specialization includes MOCVD, Semiconductor Crystal: Growth, Characterization and Device Fabrication.

Course Co-ordinator

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