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Ion beam and laser processing of semiconductor nanostructures

We have been using swift heavy ion beams and Lasers to synthesize and modify nanostructures of elemental as well as compound semiconductors and subsequently characterizing them using XRD, Raman and TEM. An overview of the dependence of the resulting new class of nano-materials on energy and fluence of the initial Swift Heavy Ions (SHI) and Lasers will be presented. These external radiations modify the electronic and optical properties of nano-structures (quantum wells, quantum dots and nanowires). Some applications of these studies in [Nanotechnology](#) in general and opto-electronic devices in particular along with their relevance in energy research as well as [biosciences](#) will also be discussed during this Materials Congress 2022.

References:

1. Robust and Low-cost Silver Dendritic Nanostructures for SERS-based Trace Detection of RDX and Ammonium Nitrate (with V S Vendamani et al) RSC Advances 10, 44747 (2020)
2. Effects of swift heavy ion irradiation on the performance of HfO₂ based resistive random access memory devices (with N Arun et al) Journal of Materials Science: Materials in Electronics (JMSE) 32, 2973-2986 (2021)
3. Green synthesis of strongly luminescent Si/SiO₂ nanoparticles using *Actinidia deliciosa*, (with Sweta Gurung, N Arun, Ajay Tripathi and Archana Tiwari) Radiation Effects and Defects in Solids 176, 38-48(2021)
4. Swift Heavy Ion Assisted Growth of Silver Nanoparticles Embedded in Hafnium Oxide Matrix (with M Dhanunjaya, D K Avasthi et al) J Appl Phys 130, 044301 (2021)
5. Trace Level Detection of Explosives and Pesticides using Robust, Low-cost, Free-standing Silver Nanoparticles Decorated Porous Silicon (with V S Vendamani, Soma Venu et al) Optics Express 29, 30045 (2021)

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Biography

Anand P Pathak, a Ph.D. from Indian Institute of Technology, Kanpur in 1971, is a Fellow of National Academy of Sciences India (NASI) F N A Sc, IOP (London) F Inst P, C Phys. He is member of International Committee, ICACS AND IBA. He was Chair ICACS20 and IBA2007. He is an Associate Editor of REDS. His postdoctoral appointments were in AERE, Harewell and CEA France. He was Physics faculty at University of Hyderabad 1977-2011 where he also served as Dean, school of Physics from 1992-1996. He was CSIR Emeritus Scientist till Dec 2016 and currently NASI Sr Scientist at University of Hyderabad He was Guest faculty in IIIT (RGUKT) Basar, and Sikkim University, Gangtok. He was Distinguished Research Scientist at CSIRO Australia, Humboldt Fellow in Germany, Chair Professor in Mexico etc. His research interests are ion solid interactions and ion beam and Laser studies of nano-materials. He has 312 publications.

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