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Ph. D. Viva Voce Examination of Mr. Suraj B Vishwakarma, through Video Conferencing is scheduled on 08/04/2021 (Thursday) at 11:30 A.M.

Research Guide: Dr. S. K. Dubey
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Title of the Thesis: Synthesis of silicon nano crystals in thermally grown SiO_2 films by silicon negative ion implantation and exploration of its applications in photonic devices

The present thesis explains the synthesis of silicon nano crystal in SiO_2 thin film matrix using ion implantation for the development of photonic devices based on silicon material. Silicon is a very useful low cost material as compared to other optoelectronic materials such as GaAs, InP and GaP. However silicon in its bulk phase cannot be used as optoelectronic material due to its indirect band gap nature.The band gap can be tuned from indirect nature to direct nature if silicon is grown at nano scale within some host materials like SiO_2. In this work, 100 keV silicon negative ions were implanted in thermally grown SiO_2 thin film with fluences varying between 1×10^{15} and 2×10^{17} ions cm^{-2} using the Negative Ion Implanter Beam Facility (NIIBF) at Inter University Accelerator Centre, New Delhi. The implanted SiO_2 samples were characterized using X-ray diffraction, Glancing angle X-ray diffraction, Fourier transform infrared, Electron spin resonance, Raman spectroscopy, Ultraviolet visible near infrared spectroscopy and Photoluminescence techniques. The XRD and GXRD results showed the presence of silicon clusters with strained SiO_2 regions. ESR studies revealed the presence of various types of vacancy defects such as P_b-centres, E'-centres, and NBOHCs within SiO_2 matrix. FTIR studies showed various vibrational modes and variations in the concentrations of Si-O and Si-Si bonds. Raman measurements showed the modifications of vibrational modes and UV-Vis-NIR results indicated the variations in the optical absorbance of the implanted SiO_2 samples with varying ion fluences. The photoluminescence study showed the variation in the emission behavior of implanted samples with respect to ion fluence. The influence of thermal annealing of implanted SiO_2 samples has provided the evidence of decrease in the vacancy defects and precipitation of silicon nano-structures in SiO_2 matrix.

Dr. S. K. Dubey
Research Guide

Dr Anuradha Misra
Professor & Head

Note: All interested Faculty Members, Research Scholars, Staff and Students are invited to attend the Open Viva Voce Examination through Video Conferencing. The link will be provided 15 minutes before the start of the Viva.

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