# Ion-implantation and analysis for doped silicon slot waveguides

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We have utilised ion implantation to fabricate silicon nanocrystal sensitized erbium-doped slot waveguide structures in a $Si/SiO_2/Si$ layered configuration and Rutherford backscattering spectrometry (RBS) to analyse these structures. Slot waveguide structures in which light is confined to a nanometre-scale low-index region between two high-index regions potentially offer significant advantages for realisation of electrically-pumped Si devices with optical gain and possibly quantum optical devices. We are currently investigating an alternative pathway in which high quality thermal oxides are grown on silicon and ion implantation is used to introduce the Er and Si-ncs into the $SiO_2$ layer. This approach provides considerable control over the Er and Si-nc concentrations and depth profiles which is important for exploring the available parameter space and developing optimized structures. RBS is well-suited to compositional analysis of these layered structures. To improve the depth sensitivity we have used a 1 MeV $\alpha^+$ beam and results indicate that a layered silicon-Er:$SiO_2$/silicon structure has been fabricated as desired. In this presentation structural results will be compared to Er photoluminescence profiles for samples processed under a range of conditions.