Van de Graaff Accelerator Utilizations in Research

Abstract

Possessing a Van de Graaff accelerator in a research Institute can indeed be a blessing. American physicist Robert Jemison Van de Graaff invented the Van de Graaff generator in 1931 focusing on creating static electricity to make it available for experimentation. IN our institute, four major beam-lines have been designed around the accelerator aiming at studying radiation Physics, Atomic Physics and Materials research. The focus of this work is to explore and present the utilizations of the accelerator as an implanter, an ion-beam-assisted mixing and surface modification tool and as an important characterization instrument with the overall objective of enhancing research ideas and academic/educational capabilities. State-of-the-art ion beam assisted surface modification and mixing of Si-Ge experiments for band-gap engineering and light emission purposes and the mixed structures are discussed in the presentation. Ion beam bombardment has also achieved excellent results of above solubility concentration levels of rare-earth metals in silicon; thus creating highly emissive impurity centers. The results of forming silicon-on-insulators (oxides and nitrides) by using the beam-line as a direct Ion implanter are also presented. Throughout the presentation, Rutherford Backscattering structural and depth analysis results exhibit the added characterization capability.