Diffusion and reaction in ultra thin dielectric films

Introduction

Ion beam analysis techniques have certain advantages over conventional spectroscopies as a near-surface compositional probe. Specifically, such techniques are in general non-destructive and capable in principle of yielding absolute concentrations, frequently at the sub-monolayer level. The cohort of available methods finds applications to metals, semiconductors and insulators, and, although there are

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The UWO Ion Scattering facility is located in the 1.7 MV Tandetron high current accelerator laboratory of the Department of Physics & Astronomy, Western Science Centre. This is a unique experimental setup, combining Rutherford Backscattering (RBS), Medium Energy Ion Scattering (MEIS) and Elastic Recoil Detection (ERD) and various implantation capabilities.

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The primary result of our program is to determine, with high spatial resolution, the correlated with studies of gate stack electrical properties and electronic structure of the semiconductor.

Oxygen exchange examined by ion scattering

Oxygen exchange rate:

Characteristics of RBS spectrum of Erdoped Si/SiOx films fabricated by ECR-PECVD

Oxygen exchange occurs in silicon during implantation of oxygen. The exchange process is illustrated in Figure 1. The oxygen exchange rate is determined by the temperature of implantation.

Current and future research projects

• Growth and thermal stability of the alternative high-k materials for gate dielectrics in MOS structure (HfO2, Al2O3, CeO2, etc. on Si, SiGe, Ge, GaAs)
• in collaboration with D. Landheer (NRC, Ottawa)
• Structure and the interface composition of the epitaxial thin films (Co:SnOx/Al2O3, SiOx/CoGaN(0001)). Evolution of the interface on the initial growth stages
  • Implementing Elastic Recoil Detection System for hydrogen detection and hydrogen/deuterium exchange
  • Improvement of the theoretical model of the energy-transfer mechanism in the medium energy ion scattering

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