

Accurate Depth Profiling of Thin Films

A SiN_x:H Film is implanted with Ga with the intention of forming a buried GaN layer. The analysis shows that the silicon is depleted and the nitrogen remains constant demonstrating that the Ga is substituting for Si in the lattice and forming GaN. We can also see that the hydrogen profile is distributed through the film.

A normal incidence RBS spectrum and simultaneously collected RBS/ERD spectra at glancing incidence are shown to the right. These three spectra are fitted together to provide the depth profile of the elements in the film.

The depth profile is determined using the DataFurnace software it employs a simulated annealing algorithm, and the uncertainty of the profile is analysed with a statistical method based on Bayesian inference using Markov chain Monte Carlo methods. The resulting depth profiles are shown below with the uncertainty limits.

Barradas, Jeynes & Webb Appl.Phys.Lett. 71, 1998, 291-293
 Barradas, Jeynes, Almeida et al, Nucl.Instr.Meth. B148, 1999, 463

