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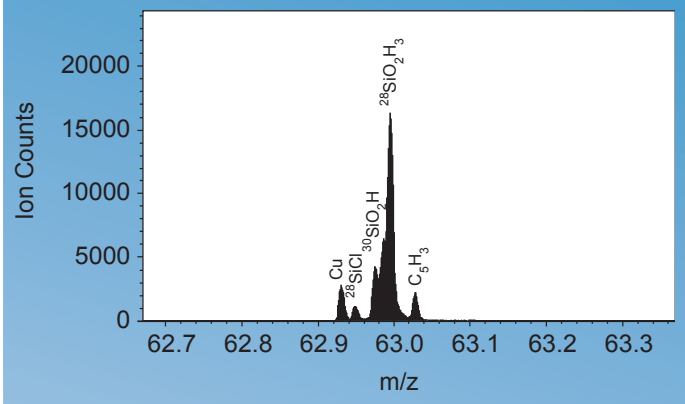
Identification of Unknown Contaminants at a Subsurface Interface

Significance of Technique

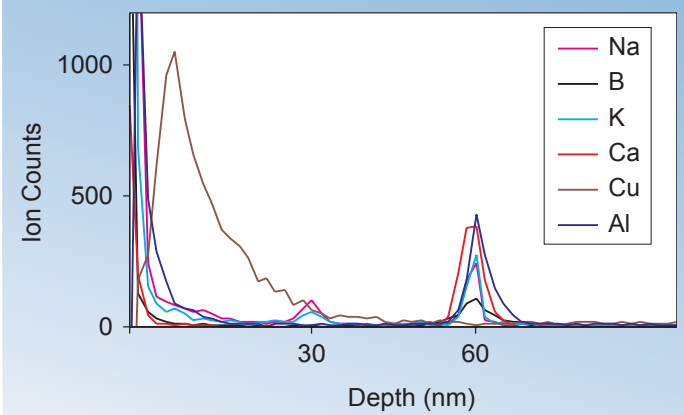
The detection and identification of unknown, low-level contaminants present at an interface or in a buried layer is a challenging task that is often important to improve or troubleshoot semiconductor processes. These measurements require an analytical technique with the ability to detect a wide range of possible contaminants with high sensitivity.

For interfaces or layers in the near-surface region (i.e., the top 300 nm of the sample), these capabilities are provided by Time-of-Flight Secondary Ion Mass Spectrometry (TOF-SIMS). In these types of measurements, TOF-SIMS provides a survey analysis of either positive or negative ions with elemental detection limits as low as 10^8 atoms/cm^2.

In the example shown below a poly-silicon (30 nm)/polysilicon (30 nm) on silicon sample was analyzed by depth profiling. The cumulative mass spectrum acquired from the entire film structure indicated the presence of Cu, B, Na, K, Al and Ca. By reanalyzing the data file, the distributions of these elements could be reconstructed.



Cu contamination observed in a cumulative mass spectrum from the film structure.



Depth profile of contaminants in the film structure.

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