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## **SCANNING AUGER MICROANALYSIS (SAM)**

Scanning Auger Microanalysis (SAM) is a surface analysis technique that determines elemental composition and some chemistry of surfaces and interfaces. SAM has a sampling depth of 2-3 nm providing analysis of films as thin as a few monolayers with a lateral resolution of 50 nm.

SAM also shows the spatial distribution of elements on a surface (SAM element images) as well as elemental depth distributions from 1 to 2000 nm (when used in conjunction with ion-milling). SAM detects all elements (except hydrogen and helium) at concentrations greater than 0.1 atomic percent.

### **SAM Applications Include:**

#### **1. Materials Evaluation**

- Identification of surface contaminants
- Verification of surface homogeneity
- Diffusion studies
- Catalyst degradation
- Interface analysis

#### **2. Failure Analysis**

- Corrosion analysis
- Stain identification
- Lifted lead bond evaluation
- Material delamination analysis
- Metal embrittlement evaluation

#### **3. Quality Control Screening**

- Comparison of good to bad samples
- Verification of surface process modification
- Relative thickness determinations on thin films

## **Principle Of Operation:**

The sample is scanned with a focused electron beam which causes Auger electrons (low energy) to be emitted from the surface. The energies of the Auger electrons are then measured providing an elemental analysis of the top few monolayers of the surface.

An argon ion beam can be used to remove surface layers from the sample, to expose a fresh surface for analysis or to produce a depth profile showing changes in elemental concentration with depth.

## **Data Output:**

SAM data can be presented as plotted spectra for the raw qualitative data, as tables for semi-quantified data, and as photographs for element images (distributions). SAM depth profiles are presented as plotted spectra.

## **Sample Constraints:**

The sample can be up to 1.5 cm x 1.5 cm x 0.5 cm in size. Most solid conductive samples (metals, microelectronics, powders) and some insulating samples (polymers, glasses, and ceramics) may be analyzed. The sample must be compatible with a  $10^{-9}$  torr vacuum and not susceptible to electron beam effects such as decomposition or desorption.