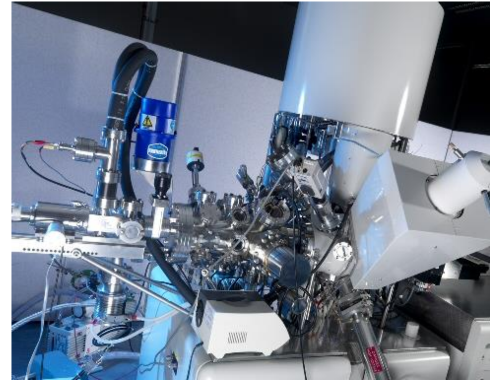
A quick NPL guide to…

Auger Electron Spectroscopy

What does AES do?



AES is used for investigating the surface chemistry of electrically conducting samples.

It provides the following information from elements (excluding H and He) in the first 2 - 10 atomic layers of a sample with a spatial resolution 100 nm:

- Elemental composition with up to 0.1% sensitivity
- Some chemical state information but not as detailed as XPS
- High resolution surface chemical imaging
- Depth profiling by analysing the sample whilst using an ion gun to sputter away the surface

How does AES work?

In vacuum, the incoming electron beam, typically with an energy between 3 and 10 keV, removes a core level electron, leaving behind a hole. As a higher energy electron falls to the lower level to fill this hole, it loses an amount of energy equal to the difference between orbital energies. If this energy is large enough, it will cause the emission of a second higher energy electron. The energy of this Auger electron will be unique to each element, and it is these Auger electrons that are analysed.

What is AES used for?

Microelectronics:

- Metallurgy
- Analysis of thin films

See our **AES measurement services** page to find out how AES may help with your specific application.

What are the measurement challenges?

Quantification is less straightforward than for XPS and can be conducted using average matrix sensitivity factors. These cover most elements and may be used for separated peaks. To use these sensitivity factors, the instrument requires calibration of its intensity / energy response function. For this purpose, NPL provides procedures for the calibration of AES spectrometers.

See our **Products and Services** page for AES measurement services and software.

Recent Publications

"Approaches to analyzing insulators with Auger electron spectroscopy: Update and overview", D R Baer, A S Lea, J D Geller, J S Hammond, L Koverd, C J Powell, M P Seah, M Suzuki, J F Watts, J Wolstenholme. *Journal of Electron Spectroscopy and Related Phenomena*, 176(1-3), 80-94 (2010)

Last Updated: 29 January 2019

NPL Management Ltd is a company registered in England and Wales No. 2937881. Registered Office: NPL Management Ltd, Hampton Road, Teddington. Middlesex, United Kingdom TW11 0LW
Telephone: 020 8977 3222