

Surface Analysis Using a Gas Cluster Ion Beam

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Surface analysts have long used high energy, monoatomic argon ion beams to probe for chemical and molecular information as a function of depth. In some cases, however, argon can significantly damage a specimen surface, resulting in artifacts that add uncertainties to the interpretation of the depth profiles or, in the case of polymeric materials, that alter or destroy the chemistry being investigated. Commercial polyatomic sources (using C₆₀ and coronene) have been useful in profiling some polymers. These sources are successful, in large part, because the material that is removed comes from depths greater than the penetration depth of the ion.

Recently, gas cluster argon ion sources (with up to 2,500 atoms per cluster) have expanded the library of polymers that are successfully analyzed. Previously difficult organic materials have been profiled to significantly greater depths while retaining their chemical integrity. For X-ray Photoelectron Spectroscopy, the results are damage-free chemical state profiles that allow routine measurements of quantitative chemical state information.

This presentation will summarize the development of the source and offer examples of its' application to a variety of specimens that had been difficult or impossible to profile prior to these developments. Examples will be given from both X-ray Photoelectron Spectroscopy and Time-of-flight Secondary Ion Mass Spectrometry.