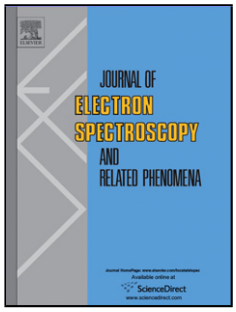

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A Study of the Pressure Profiles near the First Pumping Aperture in a High Pressure Photoelectron Spectrometer

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Abstract

In a high-pressure photoelectron spectrometer, the sample is positioned close to a differential pumping aperture, behind which the pressure is several orders of magnitude lower than the pressure in the analysis chamber. To find the optimal sample position, where the path length of the photoelectrons through the high pressure region is minimized as far as possible without compromising knowledge of the actual pressure at the sample surface, an understanding of the pressure variations near the sample and the aperture is required. A computational fluid dynamics study has been carried out to examine the pressure profiles, and the results are compared against experimental spectra whose intensities are analyzed using the Beer-Lambert law. The resultant pressure profiles are broadly similar to the one previously derived from a simplistic molecular flow model, but indicate that as the pressure in the analysis chamber is raised, the region over which the pressure drop occurs becomes progressively narrower.