

Influence of instrumental factors on Auger quantification applied to dispenser cathodes

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ABSTRACT

The electronic emission of the thermionic cathodes depend on the chemical composition of their surface. For M-type dispenser cathodes, a monolayer constituted of Ba and O on the surface of the W-Os pellet is responsible for their emission performance [1].

Auger Electron Spectroscopy (A. E. S) combined with in-situ measurement of the cathode emission allows establishing the link between the surface composition and the emission [2]. In Thales AVS Laboratory, two different Auger systems are used [3], a PHI 545 system equipped with a C.M.A (Cylindrical Mirror Analyzer) and a SPECS system equipped with a Phoibos 100 H.S.A (Hemispherical Sector Analyzer). The Auger measurements are performed at high cathode temperature (1000 °Cb). The peak intensities of elements of interest (Ba, O, W, Os) are derived from differentiated spectra. A semi-quantification is obtained in terms of ratios of peak intensities, for instance Ba/W.

It is well known that the Auger signal intensities depend on sensitivity factors linked to the considered chemical element, but also on instrumental factors [4]. The present work was focused on the influence of the differences in the instrumental factors between the C.M.A and the C.H.A, and their impact on the quantification. As a result, the cathode surface chemistry can be determined with a good correlation between the two Auger systems.

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References

- [1] G. GAERTNER, W. KNAPP, R. G. FORBES Editors, Modern Developments in Vacuum Electron Sources, Topics in Applied Physics 135, edited by Springer, Chapter 2, p. 50.
- [2] D. BRION, J. C. TONNERRE and A. SHROFF, Appl. Surf. Sci. 20 (1985) 429
- [3] J. M. ROQUAIS, in Proceedings of IVESC-ICEE, Saint-Petersburg, Russia, June 2014, p. 220.
- [4] S. HOFMANN, Auger-and X-Ray Photoelectron Spectroscopy in Materials Science, Springer Series in Surface Sciences 49, edited by Springer, Chapter 5.