

Topical Report

What is the Problem in AES

- Energy calibration in an absolute Auger electron analyzer -

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There are two methods in energy calibration in AES ; 1. to use elastically backscattered primary electrons, 2. to use atomic energy levels. The method 1 has widely been employed in a conventional calibration and the method 2 is the case in XPS. We use the method 1 in a metrological way.

Electron trajectories in the CMA for 5keV of the electrons are shown in Fig.1. In this energy range, the relativistic effect becomes significant. The relativistic focusing seems quite symmetric than that of non-relativistic. Thus the top of the spectrum peak represents a certain characteristic of the backscattered primary electrons. The energy position of the elastic peak is also the function of the temperature of the cathode filament, Wehnelt bias of the electron gun, and the workfunctions of the cathode, sample, and the CMA (and likely the electric heating current of the cathode). The characteristics of the primary currents (i_p) and the observed elastic peak position (E) for the tungsten are shown in Fig.2, in which the Wehnelt bias is a parameter. The open and the smeared circles represent the negative and positive bias, respectively.

It can be assumed that there are no space charge effect in the flat regions in the Fig.2 (a) and (b). Then with the relativistic and the thermal corrections, can be evaluated to be about 0.35eV. *(the residual error)*

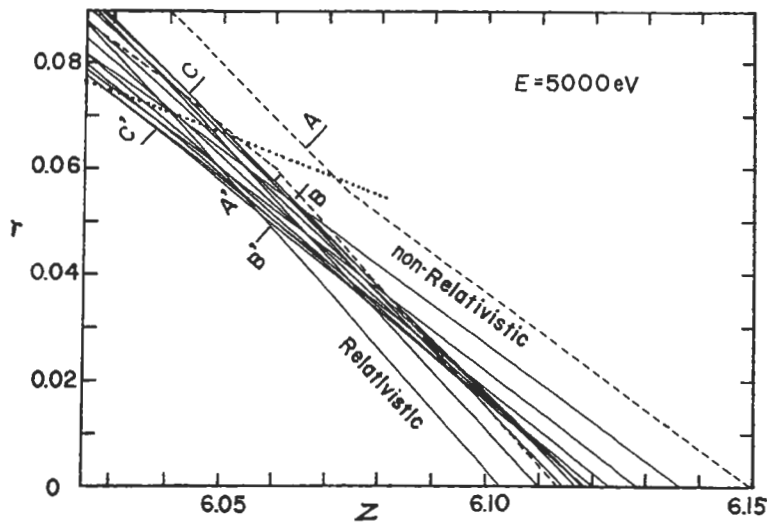


Fig.1. Relativistic focusing of the CMA at 5000eV.

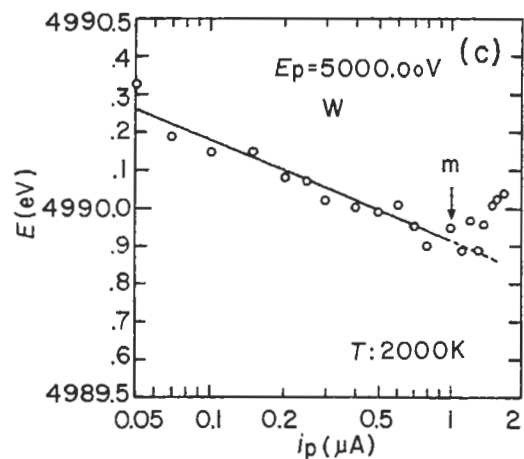
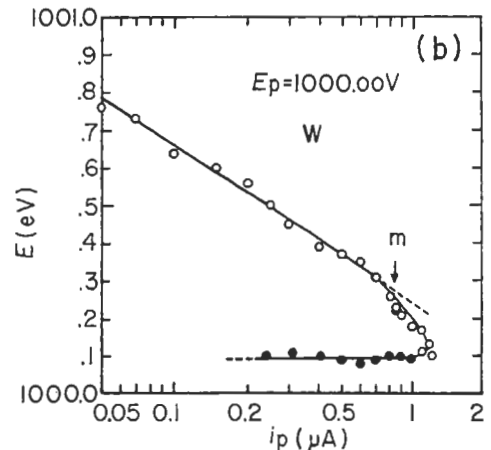
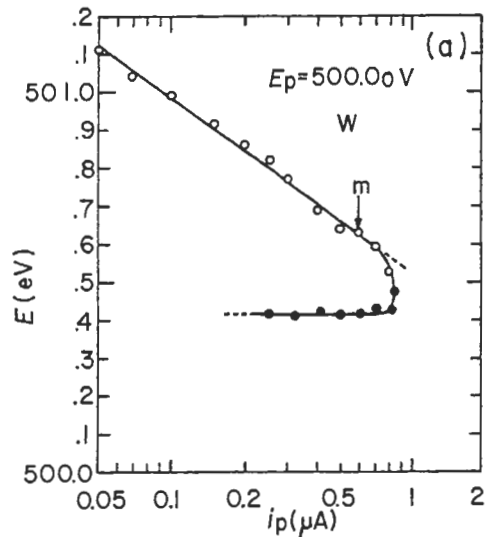


Fig.2. Elastic peak energies vs primary current by varying a Wehnelt bias.