Vapour Phase Study of Photoionisation of Tin

M. Huttula, H. Aksela, M. Jurvansuu, E. Kukk, and S. Aksela

Department of Physical Sciences, P.O.Box 3000, FIN-90014 University of Oulu, FINLAND

Using photoelectron spectroscopy, electronic structure of metals as free atoms has been actively studied since the introduction of synchrotron radiation. Recently, the research in this field has became more active as the light sources and also experiments have developed allowing more accurate studies.

We have studied the photoionisation of the 5p, 5s and 4d orbitals of atomic Sn. The photoelectron spectra of Sn in vapour phase have not been reported earlier, as far as we know. The measurements were carried out using synchrotron light at the beamline I411 of the third generation light source MAX II in Lund, Sweden. The Sn vapour was generated using home-made resistively heated oven and the photoelectrons were detected with a high resolution Scienta SES-100 electron spectrometer.

Sn is an open shell atom with the electronic configuration of $[Kr]4d^{10}5s^{2}5p^{2}$. Consequently, several close-lying neutral states are populated at the high temperature (T = 1400K) of our experiment, giving rise to multiple sets of peaks in the photoelectron spectra. The intensity distribution in photoelectron spectra of Sn has been predicted by relativistic Dirac Fock calculations applied to the thermally distributed initial states.

The results have been found to be in good agreement with the experimental data.