

Shadow spectral filming: A method of investigating electrothermal atomization. Part 1. Dynamics of formation and structure of the absorption layer of thallium, indium, gallium and aluminium atoms

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Abstract

A technique for investigating electrothermal atomization using shadow spectral filming is presented. This consists of obtaining an image of the interior of the furnace by backlighting with the analytical line of the element under study and recording the image of the shadow produced by the absorbing vapour by use of a cine camera. It is then possible to visualize the dynamics of the atomic vapour filling the furnace and simultaneously giving information on the temperature change of the furnace walls and platform. The method is used to investigate the dynamics of formation and the structure of the absorption layers of Tl, In, Ga and Al atoms in different atomization regimes. The results obtained show strong inhomogeneity of the distribution of atoms within a graphite furnace. The extent of non-uniformity is different for different elements and is largely determined by the atomizer platform. A number of anomalous effects have been established: 'inverse' atomization of the elements (the formation of atoms begins not near the platform where the sample is deposited but near the opposite wall); the anisotropy of the velocity of longitudinal and transverse propagation of the atomic vapours within a furnace; and the localization of Al under the platform.

Keywords

Electrothermal atomic absorption spectrometry, Shadow spectral filming, Visualization of atomic vapour distribution