

## Spatially resolved atomic absorption analysis

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### Abstract

Previous research carried out in our laboratories has shown that all the key parameters of electrothermal atomic absorption spectrometry, gas phase temperature, intensity of the probing beam and number density of absorbing species, are generally highly non-uniform over the absorption volume. Further, it was shown that, when using conventional detection systems based on a photomultiplier tube or a photodiode that can only detect radiation spatially integrated over their working area, absorbance measurements are subject to photometric errors when the absorbing layer is spatially non-uniform. This error is eliminated when using spatially-resolved detection of transmitted intensities with a linear solid state detector (photodiode array, linear CCD). The photometric error of the conventional detection systems does result in an analytical error, if analyte distributions in the absorption volume produced from an aqueous standard solution and the unknown sample are different. Such a differing distribution could be created under the influence of the sample matrix on the analyte gas phase distribution. An atomic absorption spectrometer is described in the paper that allows spatially and temporally resolved detection of both specific and non-specific absorbances. The effect of sample matrix on the analyte gas phase distribution is investigated when atomizing some environmental samples and, for the first time, the results of spatially-resolved atomic absorption determination of cadmium and lead in these samples are presented. It is shown that the influence of the matrix on the analyte distribution is significant, resulting in a significant analytical error. By avoiding such errors, the benefits of atomic absorption analysis with spatial resolution over conventional AAS are directly demonstrated.

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