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Effects of atomization surfaces and modifiers on the electrothermal atomization of cadmium[1]

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Abstract

Atomization of cadmium on tungsten carbide, molybdenum carbide and metallic palladium coated platforms and on pyrolytic graphite coated platforms with and without tungsten, molybdenum and palladium modifiers has been studied. A physical vapour deposition method is used for coating. A high thermal stability, a greater appearance temperature and a decrease in sensitivity are found when compared with atomization on conventional platforms. Diffusion and kinetic parameters are obtained using different models. More than one activation energy (E_a) and frequency factor (ν) are obtained depending on the atomization temperature while the atomic vapour appears. These results may indicate that more than one formation process is simultaneously present or that the evolution from one formation process to another is temperature dependent. Greater values of E_a and ν are found during atomization on the molybdenum carbide coated platform and when molybdenum or palladium modifiers are used. This may suggest that strong cadmium–metal interaction is present. This strong interaction is not present when palladium is used as a metallic coating, although a similar trend in thermal stability is observed. The contribution of the expansion to the atomic vapour dissipation is also evaluated.

Keywords: Atomization surface; Cadmium; Electrothermal atomization; Modifier

1. Introduction

Research efforts directed towards understanding the process that controls free atom formation in electrothermal atomic atomization absorption spectrometry (EA-AAS) have not been completely successful nor definite. The kinetic and thermodynamic variables associated with the process of free atom formation have been obtained in order to propose a specific formation mechanism. These variables have been calculated from different models that have used the signals coming from the atomization and temperature profiles. The models of Sturgeon *et al.* [1] and Smets [2] are still used, even though the Arrhenius type curves obtained show a sigmoidal shape. This lack of linearity has been associated with deviations probably originating from the invalidity of the assumptions made by the model used, such as a stationary state at

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