IMPACT OF THE CATHODE MATERIAL ON THE ANALYTICAL GLOW DISCHARGE

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RF-Glow Discharge Optical Emission Spectrometry is a well-established technique for direct compositional depth profiling (CDP) analysis of solid, conducting and non-conducting samples**.** The technique is based on sputtering surface atoms and their subsequent excitation in the discharge[1].

The separation of sputtering and excitation makes the technique very little prone to matrix effects. The quantification procedure is based on the observation that emission yields depend strongly on the source impedance, which varies with the carrier gas density and the secondary electron emission yield of successively sputtered layers. Despite the apparent success[1], it lacks theoretical back-up and its extension to non-conductive materials is difficult.

In this experimental work, we concentrate on the link between the secondary electron emission yield, pressure and the electrical characteristics of the rf-GDOES. The effective secondary electron emission yield for various conducting material has been determined as a function of the reduced electrical field by measuring the Paschen curves[2].

Current-voltage curves for the rf-discharge cell employing conducting materials with very different secondary electron emission yields have been measured for the pressure range including the typical analytical conditions (500 Pa).

It is important to stress the relevance of the "effective" secondary electron emission coefficient and its use as input data for GD-modeling[3]. It is still not quite clear, which value to be used as input parameter for discharge modeling. Theoretical back-up of the rf-GD quantification procedure needs a comparison of experimental and modeling work. The experimental work presented here is a part of achieving this.

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1 A. Bengtson, T. Nelis, "The concept of constant emission yield in GDOES", Anal. Bioanal. Chem, 2006, 385, pp. 568-585.

2 Ph. Guillot, Ph. Belenguer, L. Therese, V. Lavoine and H. Chollet, "Secondary electron emission coefficients of standard samples for GDOES", Surf. Interface Anal., 2003, 35, pp. 590-592.

3 Z. Donko, "Apparent secondary-electron emission coefficient and the voltage-current characteristics of argon glow discharge", Phys. Rev. E, 2001, 64, pp. 026401-1-9.

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