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1) INTRODUCTION

GDOS is a powerful technique for coatings study ; a general method of surface analysis quantification has recently been developed at IRSID; this method will be first summarized ; it will then be applied for evaluating the depth relative concentrations of the main elements in hot dip galvanized steel sheets with different Al and Pb contents.

2) THE METHOD

It simply consists in writing that the spectral intensity of the line λ , $J^A(\lambda)$, emitted by an element A located on the surface of a specimen M submitted to an ionic erosion in GDOS is equal to the energy of the photon λ multiplied by the number of atoms A sputtered in the plasma of the lamp which give rise to this light emission per unit of time. This leads to the equation :

$$J^A = K^A \cdot Y^M \cdot I \cdot C^A$$

K^A is a factor independant of the matrix. Y^M is the global sputtering yield, which depends on the nature and composition of the specimen ; I is the current in the lamp and C^A the atomic concentration of A.

The coefficients K can be determined for every element from standards. So it is possible to get the relative atomic concentrations x at any depth by the following relation :

$$x^A = \frac{J^A \cdot K^B / K^A}{J^B \cdot K^A / K^B + J^C \cdot K^A / K^C + \dots}$$

3) APPLICATIONS

The method has been applied to several types of hot dip galvanized coatings ; as an example, figures 1 and 2 present the spectral intensity profiles of Zn, Al, Pb and Fe for specimen called G_1 and G_2 galvanized in following baths :

	Zn	Al	Pb
G_1 at%	99,6	0,34	0,035
G_2 at%	88,7	11,3	-

The relative atomic concentrations of the elements Zn, Al, Pb, Fe at some particular points of the intensity profiles are given table 1.

In conclusion, this method allows the determination of the composition of a coating at any depth ; but the results, to be rigorous, require that the sputtering steady state has been reached and that the specimen is lateraly homogeneous ; this is not the case for industrial coatings, so the results are only average values of the in-depth concentrations.

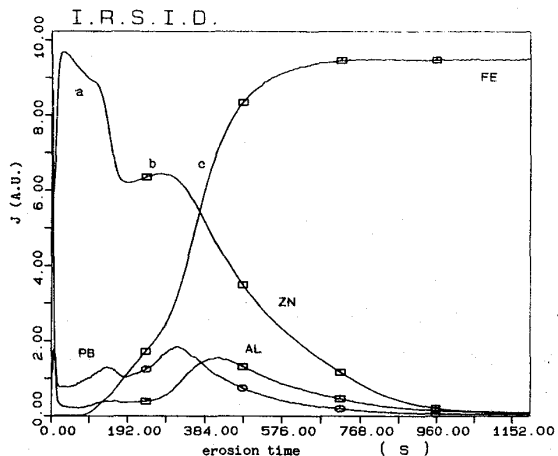


Fig. 1 : Intensity profiles J for G_1

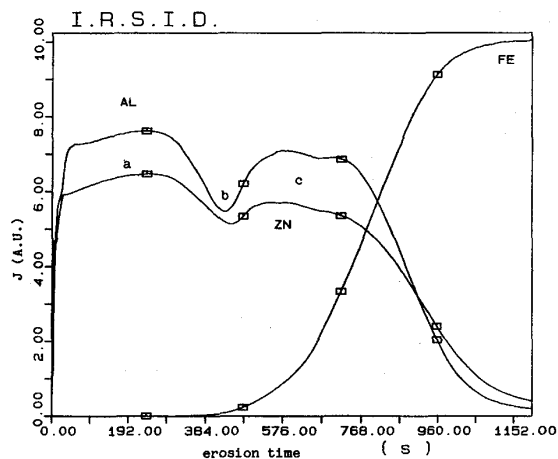


Fig. 2 : Intensity profiles J for G_2

G_1	a	b	c
Al at%	0,06	0,2	1,0
Pb at%	0,01	0,03	0,03
Fe at%	0,03	5	26
G_2	a	b	c
Al at%	12,6-11,6	11,6-10,5	12,8-12,7
Fe at%	-	0,4-0,4	3,5-2,2

Table 1 : Relative concentrations x at%