

# QUANTITATIVE CHARACTERIZATION OF ELECTROSORPTION OF CR SPECIES ON POLYCRYSTALLINE GOLD WITH X-RAY SPECTROMETRY

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Electrosorption processes of Cr species labeled with <sup>51</sup>Cr were investigated ‘in-situ’ by the radiotracer foil method using the X-ray detection technique. Empirical and theoretical calibration methods were elaborated to evaluate the surface excess concentration (i.e., surface-concentration of the specifically adsorbed species) of the Cr(VI) ions (and/or their reduction products) on a polycrystalline gold substrate, deposited onto surface of a thin polyethylene foil by vacuum plating. The soft X-ray spectra emitted by <sup>51</sup>Cr radionuclides both from the solution and the surface of the gold electrode were measured by a NaI scintillation spectrometer and by a Si PIN detector [1] having 25 μm Be window. Since the recorded spectra were not distorted by overlapped peaks, a simple fitting model, using a log-log type and Gaussian function, offered an appropriate quantitative evaluation mode for the poorly resolved scintillation spectra. On the basis of the spectral background originating from the <sup>51</sup>Cr-labeled solution in the measuring cell, a simple mathematical model [2] was applied to calculate the surface excess concentration. This approximation considers all the geometrical and absorption conditions between the radiation of the deposited layer and the detector crystal.

In order to verify this model calculation, radioactive Na<sub>2</sub>CrO<sub>4</sub> solution spots, having an activity in the range of 0.8 to 17.4 kBq, were dropped onto a gold covered polyethylene foil to simulate a sorbed Cr layer. Error analyses for the model calculation and empirical calibration method were performed and an acceptable agreement was found between the two data series within the predicted standard deviation. The voltammetric measurements carried out simultaneously with the in situ radiotracer experiments give information about the charge transfer occurring in the course of electrosorption processes.

[1] I. Szalóki, K. Varga, R. Van Grieken, *Spectrochim. Acta B*, **55**, 1029-1036 (2000)

[2] K. Varga, I. Szalóki, L Gáncs, R. Marczone, *J. Electroanal. Chem.* (in preparation)