COMBINATION OF THE ELECTROCHEMICAL QUARTZ CRYSTAL MICROBALANCE WITH RADIOTRACER TECHNIQUE

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Quartz crystal microbalance (QCM) is a suitable technique for measuring the modest mass changing on the crystal, but it do not provide any information about the reason of the changing and nothing about the adsorbed ion. It is necessary to combine the QCM with another ion specific method as the radiotracer technique.

In-situ electrochemical tracing technique is a well known method. The most popular version is the thin foil method when the foil surface is coated with the sample. Placing the detector under the foil, the adsorbed, traced and β-radiant isotope can be investigated. An electrochemical cell was planned and constructed which contains a quartz crystal instead of the foil thus the mass of the isotope can be measured. The surface of the quartz crystal is coated with metal mostly with evaporated gold layer which is electrochemically sensitive surface. The most popular 3-electrode composition was implemented, where the quartz with the gold layer was the working electrode, the saturated calomel electrode connected by a Luggin-capillar was the reference electrode and counter electrode was the platinum wire hanging into the solution.

The experiments were performed in a 0,1 mmol/dm3 HClO4 and 1 mmol/dm3 Na36Cl solution. It is well known how to measure chloride adsorption from HClO4 solution and its electrochemistry also well described, that is the reason why I chose it for the test. 1mV/s scan rate was used for measuring the cyclic voltammogram and simultaneously detect the 36Cl isotopes. The anodic side of the CV (870-1050mV in the range of the gold double layer) the chloride adsorption can be observed which can be verified by β- spectrometry as well.