

Cobalt Deposition and Dissolution

Summary

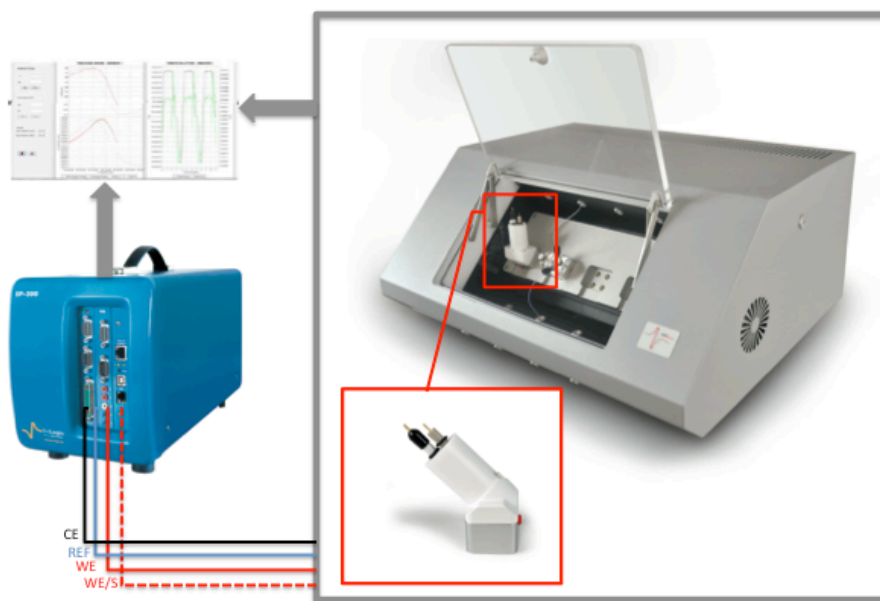
Use of AWS A20 RP in combination with a compatible potentiostat to perform an electrochemical study of deposition and dissolution of metallic layers onto the gold electrode of an AWS HFF-QCM sensor.

Material and methods

Materials: A 100MHz AWS HFF-QCM sensor was used with AWS A20 RP platform in combination with the SP-200 floating mode Potentiostat/Galvanostat from Biologic. The signals associated with the sensor phase monitoring in the AWS A20RP and the current and potential measurement of the SP-200 were monitored. The deposition solution was 10mM K₂SO₄ + 0.001M KCl + 0.001M H₂SO₄ + 0.001M (CoSO₄)·7H₂O solution. A Pt counter electrode was used with a saturated KCl solution Ag/AgCl reference electrode. The working electrode was the grounded electrode of the AWS HFF-QCM sensor.

Cyclic Voltammetry: Determination of the Nernst equilibrium potential and the investigation of the overpotential deposition of Cobalt on the gold electrode of the HFFQCM. The potential was held at -0.4V ten seconds before starting the cyclic voltammetry. A potential scan with a rate of 10mV/s was applied from -0.4 to -1.5V.

Underpotential Deposition: Controlled deposition of atomic layers of Cobalt on the AWS HFF-QCM sensor.

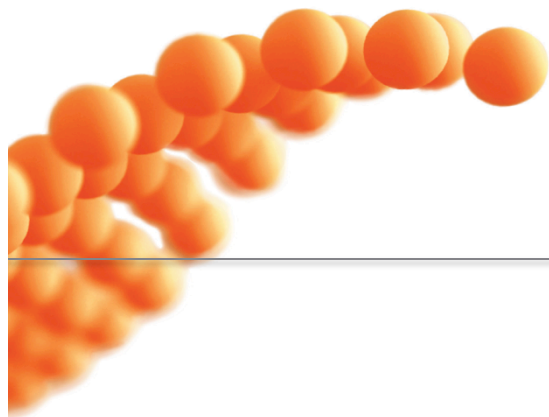


Deposition

Dissolution

Electrochemistry

HFF-QCM



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Results

Figure on the right shows the typical cyclic voltammogram of the overpotential deposition of Cobalt on the high resolution microbalance sensor. Similarly to classical QCM, where frequency shifts occur during bulk deposition, phase- shift changes are found correlated with deposition and dissolution current peaks during the electrochemical experiment.

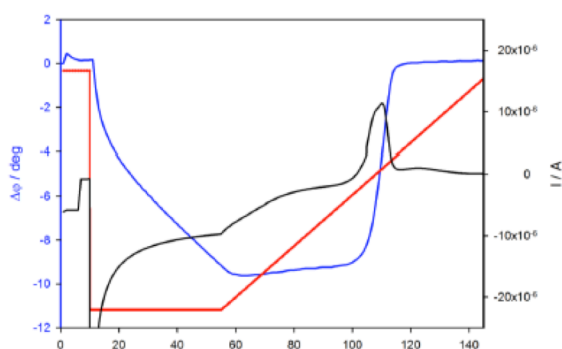
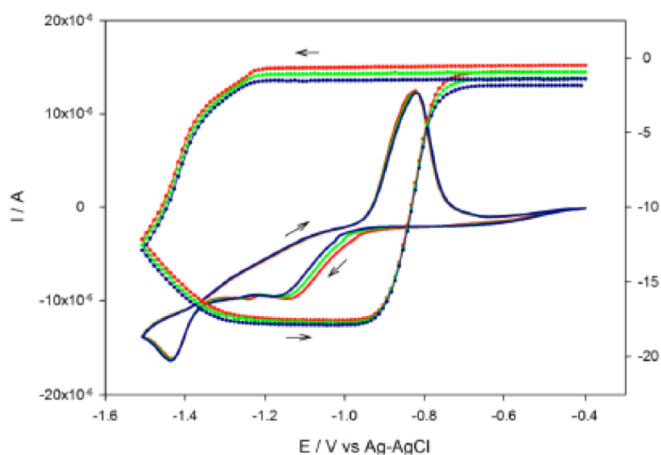


Figure on the left shows the current and phase- shift monitoring when potential step of -1.3V is applied. With this potential step below the Nernst equilibrium potential only few layers of cobalt are deposited on the HFFQCM gold electrode. The potential is maintained during 30 seconds and a linear potential decrement with a rate of 10mV/s is applied. Phase- shifts show the deposition and dissolution of cobalt during the experiment.

Order Information

Product

Quantity References

AWS A20 RP 1 channel

1

AWS A20 000011 B

HFF-EQCM in-batch cell for AWS A20

1

AWS CLS 000119 Q

AWS HFF-QCM sensor 100 MHz

1

AWS SNS 000001 A

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