Electrochemical Quartz Crystal Microbalance study of CdTe deposition by electrochemical atomic layer epitaxy (EC-ALE).

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Binary Cadmium compound semiconductors (CdS, CdSe, and CdTe) are important materials for optoelectronic applications. CdTe is an important II – VI compound with a direct band gap of 1.5 eV at room temperature. The importance of the potentials used to deposit Cd and Te were investigated. These potentials were used in an EC-ALE cycle to form deposits one atomic layer at a time, using a sequence of surface limited reactions.

EQCM was used to study CdTe deposition via EC-ALE. Current and Δf (frequency change) data were recorded simultaneously, as a function of deposition time. Cyclic voltammetry was used to determine the under potential deposition (UPD) of Cd and Te. The optimum potentials for CdTe cycle included Cd deposition at -0.650V, Te deposition at -0.350V and bulk Te stripping at -0.700V.The coverage is calculated based on the mass and also based on the charge.

CdTe films were formed on gold on glass substrates .Studies of the formation of CdTe using EC-ALE on gold coated quartz crystal will be presented. The $CdS0_4$ concentration was 0.5 mM, pH of 5.0. The TeO_2 concentration was 0.2 mM with a pH of 4.0. A pH 4.0 blank solution was used as well. Solution pH was adjusted using H_2SO_4. The supporting electrolyte was 50mM Na_2SO_4.

XRD diffraction pattern indicated that films were preferential (111) orientation. EPMA results indicated that the films were stoichiometric.