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PLD growth of multilayered MgO/Ag(001)/MgO photocathode
DANIEL VELAZQUEZ, ZIKRI YUSOF, LINDA SPENTZOURIS, JEFF TERRY, Illinois Institute of Technology — Films of of Ag, MgO and multilayers of these were grown via pulsed laser deposition on clean Si(111) 7x7 substrates. The films were studied using reflection high-energy electron diffraction, Kelvin probe and ellipsometry. Information about crystalline and atomic structure as well as surface condition, work function and film thickness was obtained using these techniques. Deposition at various substrate temperatures and partial oxygen pressures was performed in order to understand the parameter settings that lead to higher quality crystalline films. Epitaxial films of Ag(111) were found to grow at an optimal substrate temperature of 256 °C (fig 1.). The superstructure Ag(111) $\sqrt{3}$ x $\sqrt{3}$ occurs when deposition takes place at a substrate temperature of 620 °C. In addition, MgO films were found to grow with small grain size on both, Si(111) 7x7 and Ag(111)/Si(111) at room temperature with a partial oxygen pressure of $5\text{x}10^{-5}$ Torr (fig. 2). Highly-oriented, polycrystalline growth of MgO films is evidenced by their RHEED pattern. In addition, the obliquely-shaped diffraction spots indicate the growth of secondary phase precipitates, most likely due to oxygen deficit. Measurements of the work function of these multilayers indicate that the Ag(111) work function (4.75 eV) is sharply suppressed with the first few MgO shots and has a quasi-linear increase for the first few monolayers (fig. 3). As the thickness of MgO increases (a few nanometers) the work function drops again and stabilizes at the level of MgO (∼4.2 eV).

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