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Synthesis of Ultra-Thin Single Crystal MgO/Ag/MgO Multilayer for Controlled Photocathode Emissive Properties DANIEL VELAZQUEZ, RACHEL SEIBERT, ZIKRI YUSOF, JEFF TERRY, LINDA SPENTZOURIS, Illinois Institute of Technology — Developments of new accelerator technologies such as free-electron lasers and high-energy accelerators, among others, continuously set requirements for particle sources to produce higher beam flux. The emissive properties of these photocathodes directly influence the accelerator beam flux and thus the performance of the accelerator as a whole. The objective of this project is to test the possibility of engineering the photoemissive properties of materials for potential use as photocathodes. For this purpose we use a Density Functional Theory calculations by collaborator Karoly Nemeth et al. [Phys. Rev. Lett. 104, 046801, 2010], which predict a thickness dependent change in the band structure that results in a change in the work function and dispersion of occupied states at the Fermi level. Multilayered MgO/Ag/MgO in the crystallographic orientations (001) and (111) were grown on Ag/MgO(001) and Ag/Si(111), respectively using pulsed laser deposition (PLD). A series of surface probing techniques were used to characterize physical, chemical and photoemissive properties of the films.

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