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Understanding the effects of electron affinity on spin-polarized photoemission

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GaAs photocathodes operated in a negative electron affinity (NEA) state typically achieve 35%-40% photoemitted electron spin polarization (ESP). However, when operated in a slight positive electron affinity (PEA) state, the barrier for electrons to escape into vacuum can cause upwards of 50% ESP electron beams to be photoemitted. In this proceeding, we explore the mechanisms and limitations of this effect. This is done experimentally with ESP measurements performed in a retarding-field Mott polarimeter on GaAs photocathodes with varying electron affinities, and theoretical modeling of material properties through Monte Carlo simulations.

Footnotes

Paper preparation format

LaTeX

Region represented

America

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