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Studying photoemissive properties of stable Cs-Sb compound thin-film photocathodes using a combination of Monte Carlo simulations and Density Functional Theory

Tuesday 3 June 2025 16:00 (2 hours)

Cs-Sb compound thin-film photocathodes are an excellent candidate to produce bright electron beams for use in various accelerator applications. Despite the virtues of these photocathodes being known, the mechanics that govern their photoemission are not well-understood. Crystalline and other material properties affect the mean transverse energy (MTE) and quantum efficiency (QE) and, thus, the overall brightness. Electrons photoemitted from these thin-film crystals experience an unexpected energy loss similar to that found in bulk crystals despite their being a significantly shorter transport phase. Deeply understanding the relationship between the crystalline properties and the emitted electron beam's brightness, as well as this drop in energy, is vital to generating ultra-bright electron beams for advanced accelerator applications. The purpose of this work is to use the Monte Carlo method to simulate photoemission from semiconducting films with electronic band structure parameters supplied by Density Functional Theory (DFT) calculations. This method is used to study all steps of photoemission and to identify the key parameters necessary for optimizing photocathode performance.

Footnotes

Paper preparation format

Region represented

America

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