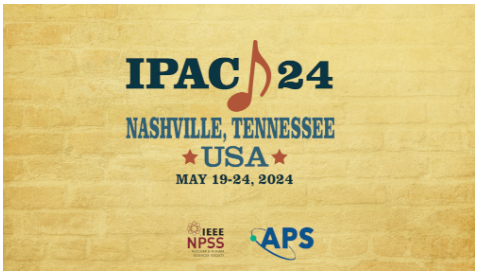

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Exploiting optical interference effects to enhance the quantum efficiency of photocathodes

Sunday, 19 May 2024 16:00 (2 hours)

We present measurements of quantum efficiency (QE) modulations in CsSb and Cs3Sb photocathodes that arise from optical interference of reflections from the underlying substrate that has multiple semi-transparent layers. The photocathode films are grown on a cubic silicon carbide layer (3C-SiC) which itself is grown epitaxially on Si(100) during fabrication. We find that the QE modulates by up to a factor of two over a laser wavelength range of 30 nm, and that a modulation peak can be tuned to coincide with a desired laser wavelength by changing the thicknesses of both the photocathode and the silicon carbide layer in the substrate. A model for the QE modulations is derived and fitted to QE measurements of CsSb and Cs3Sb films, which have different indices of refraction, in addition to QE measurements of Cs3Sb films grown on 3C-SiC substrates with two different silicon carbide layer thicknesses. Good agreement is found between the model and measurements, confirming the optical interference effect can be exploited to enhance quantum efficiency at desired visible wavelengths.

Footnotes

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