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Synthesis of efficient ordered sodium potassium antimonide photocathodes via molecular beam epitaxy

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Alkali antimonide photocathodes exhibit high efficacy as photoemissive materials in electron sources. This proceeding explores the fabrication of thin, ordered films of sodium potassium antimonide via molecular-beam epitaxy (MBE) at the PHotocathode Epitaxy Beam Experiments (PHOEBE) laboratory at Cornell University. Utilizing a sequential deposition technique, the photocathodes are characterized in terms of both quantum efficiency (QE) and crystal structure with the goal of reducing the chemical and physical roughness. A spectral response from 400 to 700 nm demonstrates oscillations resulting from optical interference within the (SiN) substrate. Reflection high-energy electron diffraction (RHEED) patterns confirmed the successful growth of ordered crystal structures for the first time in a sodium potassium antimonide photocathode. Additionally, we investigated the photocathodes' sensitivity to oxidation, revealing their relative robustness compared to CsSb or KSb photocathodes. Notably, the incorporation of higher partial pressures of oxygen during growth improved QE and extended the operational lifetime of the photocathodes.

Footnotes

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Author: FLINT, Abigail (Cornell University (CLASSE))

Co-authors: GALDI, Alice (University of Salerno); PENNINGTON, Chad (Cornell University (CLASSE)); ECHEVERRIA, Elena (Cornell University (CLASSE)); MAXSON, Jared (Cornell University); GONZALEZ, Natalie (St. Olaf College)

Presenter: FLINT, Abigail (Cornell University (CLASSE))

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