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Molecular beam epitaxy of Cs-Sb thin films: structure-oriented growth of high efficiency photocathodes - REMOTE

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Cs3Sb and related alkali antimonide compounds are high efficiency semiconductor photocathodes that can be operated with visible light and possess quantum efficiency of the order of 1-10% at green light wavelengths. Use of these photocathodes in modern linear accelerators is desirable thanks to their potential to generate high brightness electron beams. However, the ultimate brightness of a photocathode is limited by surface disorder of the usually polycrystalline and inhomogeneous films. We used state-of-the-art molecular beam epitaxy with innovative alkali sources to achieve epitaxy of the Cs3Sb phase, which allowed to measure its band structure via angle-resolved photoemission for the first time. The use of in-situ reflection electron diffraction allowed us to prioritize the optimization of the structural properties above the quantum efficiency during the growth. This allowed us to explore new growth regimes giving rise to different Cs-Sb phases with interesting properties.

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