

# Photocathodes for high average current electron beam: state-of-the-art and new perspective

*Tuesday, 4 October 2022 16:40 (20 minutes)*

Attaining high quantum yield, low emittance, and long lifetime from an alkali antimonide photocathode has remained a sustained focus in recent years, due especially to the need for electron beams of high average current for ERL-based electron cooling systems, synchrotron radiation sources, electron ion colliders and other applications. The ongoing development of photocathodes is motivated by the unprecedented needs of these applications, namely simultaneous optimization among photoemission metrics that tend to be linked by the underlying physics. This report reviews the efforts that utilizes a new suite of materials science tools to address the poor crystallinity and lack of surface and bulk engineering that has previously limited the performance of the alkali antimonide materials. This report will also review the progress in the development of the 2D material encapsulated alkali antimonide photocathodes.

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**Session Classification:** Electron Sources

**Track Classification:** Electron Sources