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An upgrade for the CeC cathode deposition system: co-deposition of K₂CsSb and CsTe/GaAs for CeC use

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Semiconductor photocathodes are key for the fast development of electron accelerators with high current electron beams and photon detectors, to fulfill these requirements one looks for photocathodes that should have merits like high QE, low thermal emittance, long lifetime, etc. Compared to the traditional sequential deposition, the co-evaporation method is reported to yield better surface roughness, film crystallinity and high quantum efficiency for photocathode materials*. Here we present the effort in upgrading the CeC photocathode deposition system to adapt the co-evaporation growth method, the development of the co-evaporation recipe and the preparation of K-Cs-Sb photocathode using the developed system. QE of about 6.3% at wavelength 532 nm was obtained for co-deposited K₂CsSb photocathode, where stoichiometry was determined by the deposition rate of each element. The system upgrade also enables the preparation of GaAs photocathodes activating with Cs-Te. In our study, both CsTe and CsTe/CsO activated GaAs are prepared using the “yo-yo” method. QE of about 3.6% and 5.8% at wavelength 532 nm are obtained respectively. Lifetime measurements are performed and results are reported.

Footnotes

*M. Gaowei et al., PHYSICAL REVIEW ACCELERATORS AND BEAMS 22, 073401 (2019)

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Primary author: Dr MONDAL, Kali Prasanna (Brookhaven National Laboratory)

Co-authors: BISWAS, Jyoti (Brookhaven National Laboratory); WALSH, John (Brookhaven National Laboratory); BEGAY, Rudy (Brookhaven National Laboratory); CULTRERA, Luca (Brookhaven National Laboratory); GAOWEI, Mengjia (Brookhaven National Laboratory)

Presenter: Dr MONDAL, Kali Prasanna (Brookhaven National Laboratory)

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