STATUS OF CsBr PHOTOCATHODES

A) We have experimentally verified the 3-step model of photoemission for energy spread and emittance measurements of copper and CsBr-coated copper photocathodes. The data analysis uses expressions for the quantum efficiency and the intrinsic emittance for metal cathodes previously derived from Spicer's three-step model of photoemission. Data taken with a parallel plate energy analyzer and a 257 nm CW laser on (100) Cu crystals indicate a normalized intrinsic emittance of 0.77 microns/mm-rms for CsBr coated and 0.42 microns/mm-rms for uncoated cathodes. The high Q.E. and low emittance observed with CsBr coated cathodes have applications in FEL's and other devices requiring high brightness electron beams.

B) We have successfully demonstrated the Q.E. enhancement on CsBr/Cu photocathodes relative to plain Cu photocathodes with 7 ns and 2 ps UV laser pulses at 266 nm, extending previous work performed on a lithography tool. The apparent Q.E. with 7 ns and 2 ps UV laser pulses appear to be due to space charges effect at the low cathode bias electric fields utilized in the experiments. We have also demonstrated that the CsBr films can withstand the 2 ps pulsed operation without adverse effects including ablation. The results are very encouraging for accelerators and x-ray sources including free electron laser applications. Proposed future work- will address shorter pulses, higher extracting electric fields, lifetime limitations and other possible photocathode materials including a europium doping of CsBr.

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