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Boosting Photocathode Performance through Plasmonic Effects and In-situ Rejuvenation Techniques

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Semiconductor Cs-Te photocathodes are essential components in high-brightness electron sources, playing a pivotal role in the operation of large-scale accelerators. However, their operational lifetime and efficiency remain critical challenges. To address these challenges, we explore two complementary approaches to enhance photocathode performance and longevity: First, we analyze the systematic production and rejuvenation of Cs-Te photocathodes, and second, we introduce a novel method to overcome the limitations of conventional photocathodes by utilizing direct-laser nanostructuring techniques on copper substrates. This nanoengineering approach excites localized surface plasmons, generating hot electrons that contribute to a substantial increase in quantum efficiency (QE).

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