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Automated Activation Procedure for GaAs Photocathodes at Photo-CATCH*

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Photo-electron sources using GaAs-based photocathodes are used to provide high-brightness and high-current beams of (spin-polarized) electrons for accelerator applications such as free-electron lasers (FELs) and energy recovery linacs (ERLs). Such cathodes require a thin surface layer consisting of Cs and an oxidant in order to achieve negative electron affinity (NEA) for efficient photoemission. The layer is deposited during a so-called activation procedure, whose performance greatly influences the resulting quantum efficiency of the photocathode and robustness of the layer. It is therefore of great interest to optimize and standardize this process in order to provide easily reproducable high-performance GaAs-photocathodes. An automatization of the activation procedure could simplify and accelerate this process, indipendent from expert input, for operational use in an accelerator.
At the Institue for Nuclear Physics at Technische Universität Darmstadt, a dedicated test stand for Photo-Cathode Activation, Test and Cleaning using atomic-Hydrogen (Photo-CATCH) is available for GaAs photocathode research. The components of its activation chamber are remote-controlled using EPICS. This contribution will present recent proof-of-principle studies of a basic automated activation procedure at Photo-CATCH. Using a co-deposition scheme with Cs and O2, several automated activations have been performed. A good reproducibility of quantum efficiency has been observed, with a slight reduction in mean quantum efficiency compared to manual activation.

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Category

Polarized Sources

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