

Photoemitter Cathode Studies

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Laser illuminated photocathodes are used as electron sources for a number of different applications, and they have unique properties which make them ideal for electron accelerators. For example, by pulsing the incident laser beam, one can produce a pulsed electron beam to match the timing of an accelerator. The spot size and intensity can also be varied by changing the laser size and power. Such possibilities provide many degrees of freedom that accelerator designers can use to improve the operation of their machines.

Photocathodes can be difficult to use, though, and are often sensitive to the environment that they are in. Finding materials that emit electrons with high efficiency, have a long lifetime, fast response and small angular spread is an important field for high performance accelerators such as we build here at Cornell. For this project, the student will learn about cathodes and how to make and characterize their performance. In particular, they will study alkali metal cathodes and study how to optimize the growth parameters to get the best efficiency.