**Problem**

Efficiency vs. Effective Lifetime in photoinjection environment

- CaZnS (215nm)
- CaZnS (220nm)
- CaS (250nm)
- Carbon (250nm)
- CdsS (520nm)
- Cds (520nm)
- CdsTe (750nm)
- CdsTe (820nm)
- CdsTe (850nm)
- CdsTe (860nm)

Current status

**Our idea**

Atomically thin two-dimensional (2D) coating layer

Photocathodes


**QE through graphene**

- 2 layers graphene
- 3 layers graphene

**K₂CsSb reference QE**

- 2 layers graphene
- 3 layers graphene

N.A. Moody *US patent 8,823,259* (2014)