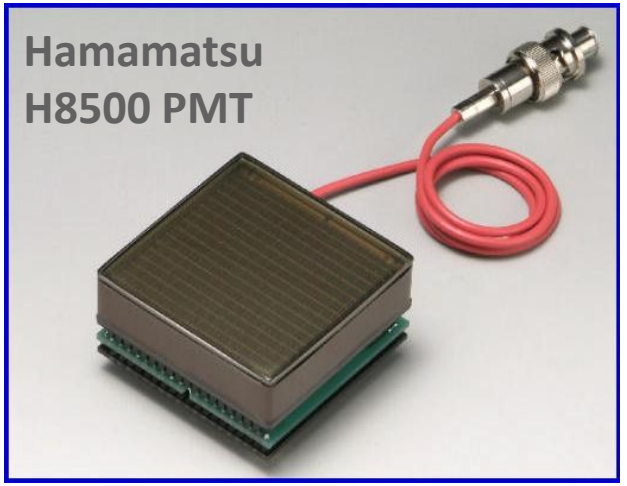
Photocathode for UV photodetectors

Junqi Xie
High Energy Physics Division
Argonne National Laboratory

Applications of Photocathode

Photo-detectors: image intensifiers, photomultipliers, streak cameras
Requirements for photocathode

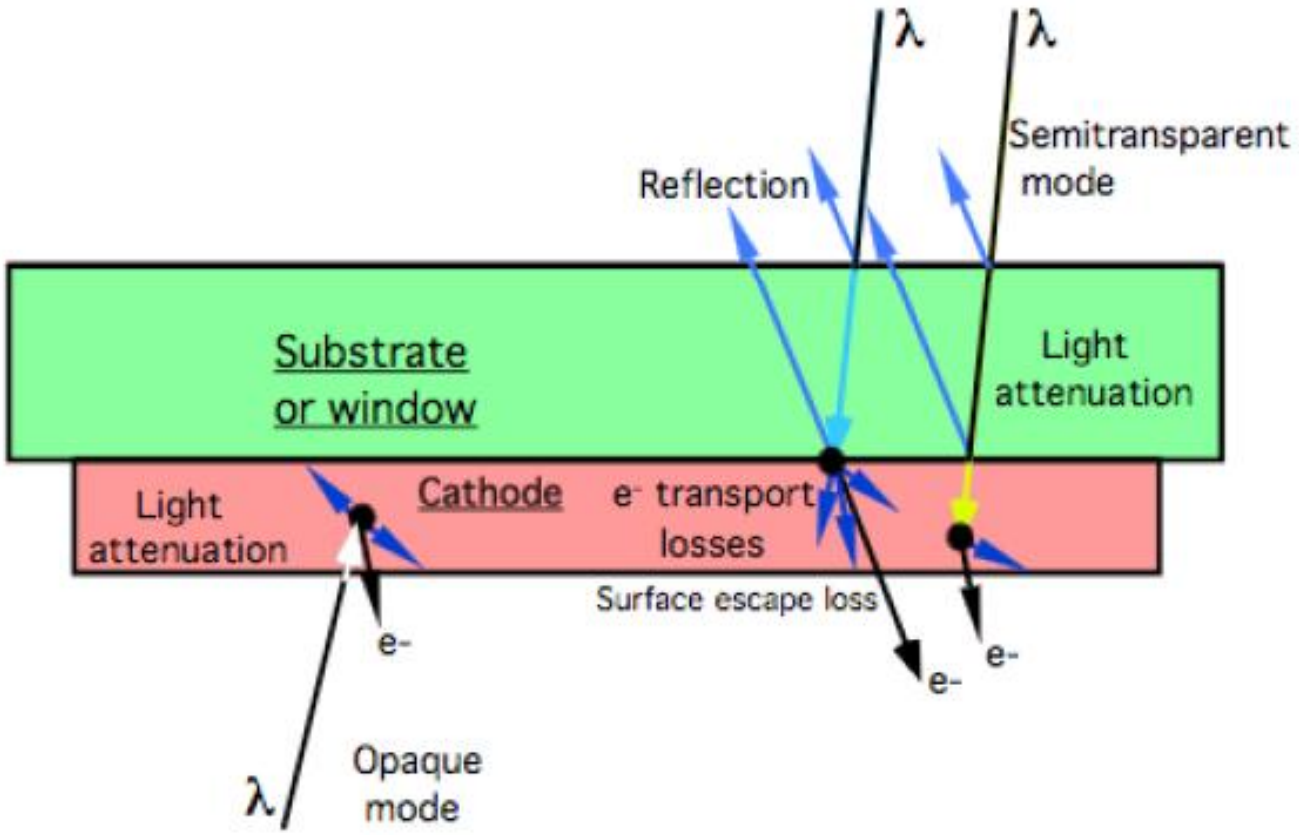
- Low cost
- Large area
- High QE
- High Gain
- Low dark current
- Time of flight response
- ……



X-ray source: next generation free electron laser (FEL) X-ray light source
Requirements for photocathode

- High repetition rate
- High brightness
- Low emittance
- Long lifetime
- High QE at 532nm
- ……

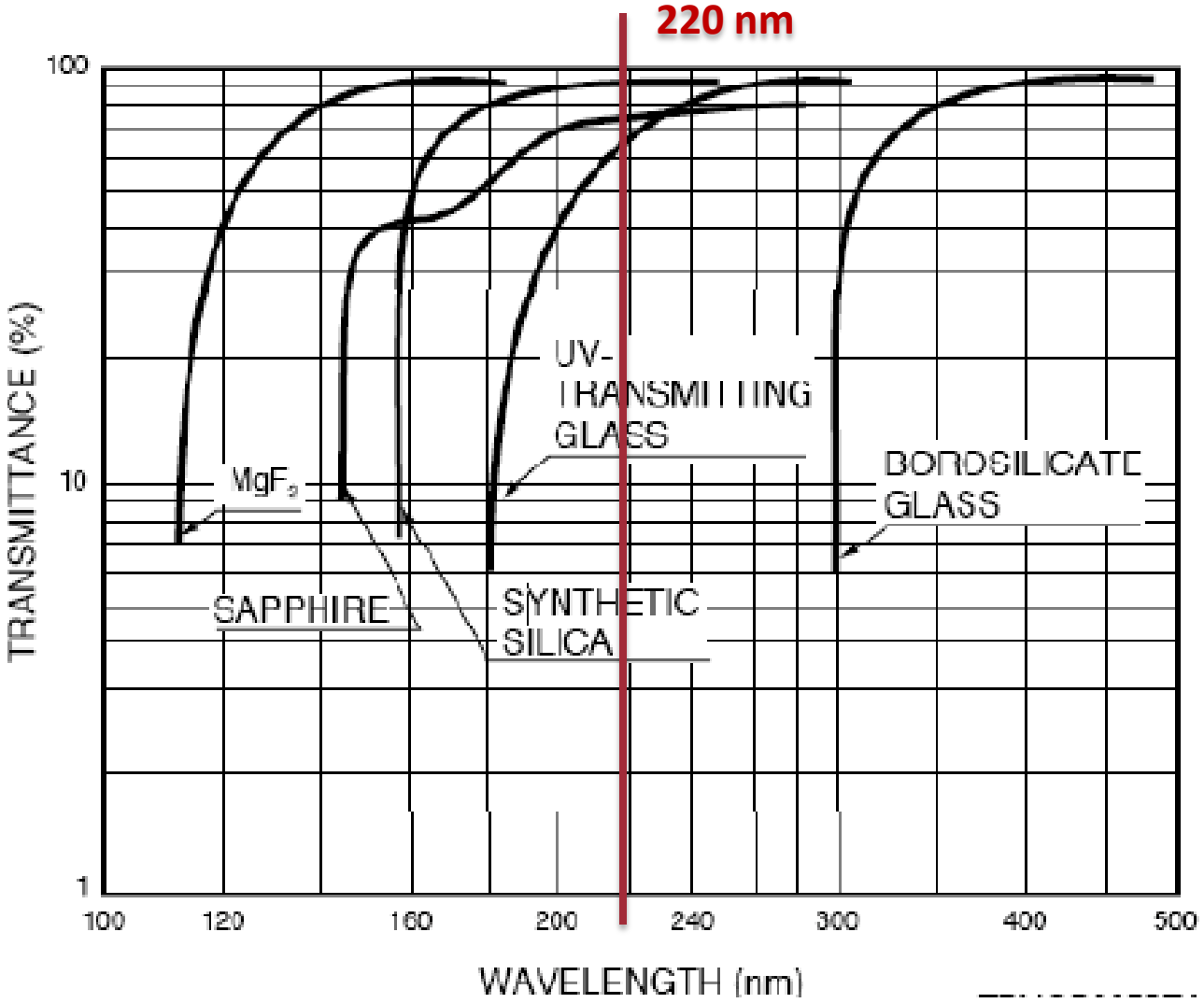
Photocathode configuration in photodetector



Two factors affect the wavelength response:

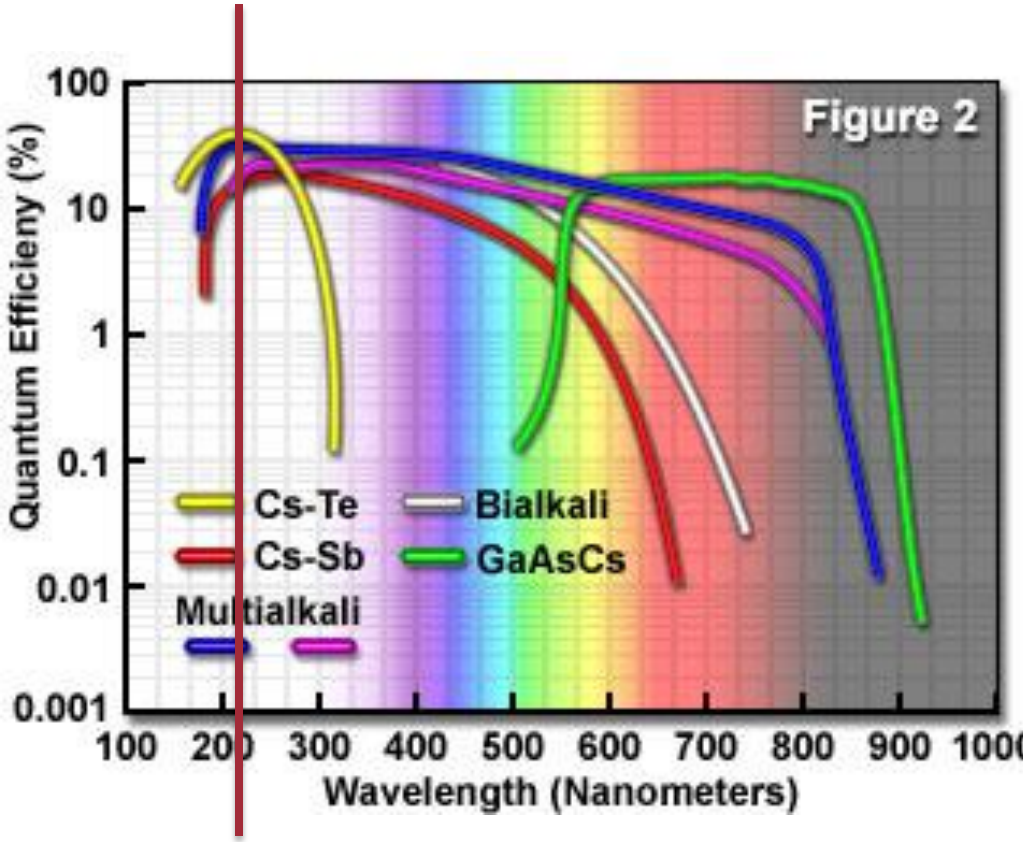
1. **Substrate:** reflection, absorption, transmission
2. **Material:** QE response, crystalinity, surface roughness

Window transmission curve

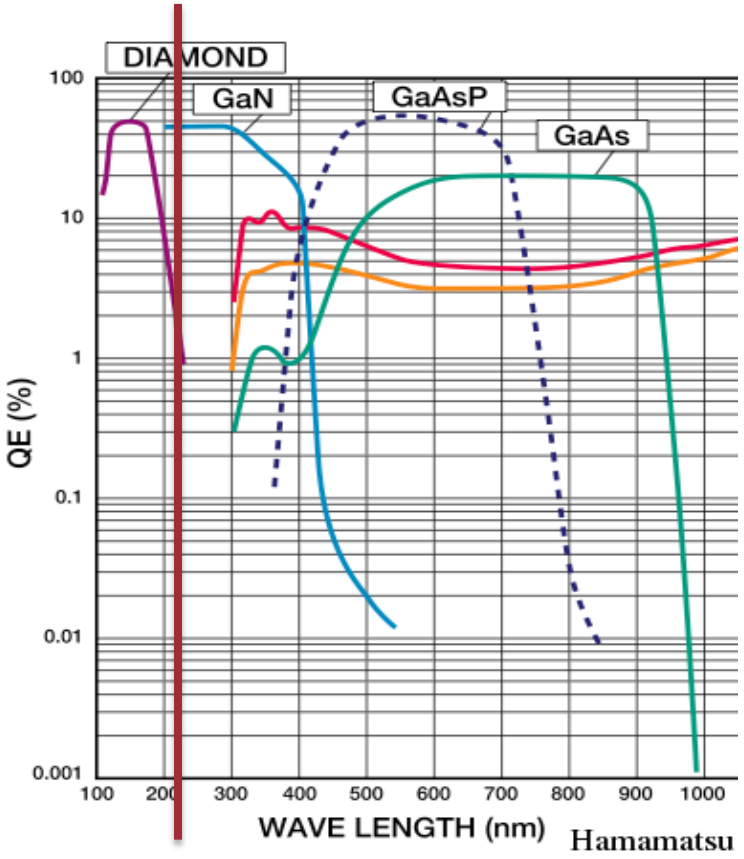


Window options: MgF2, Sapphire, Synthetic Silica

Photocathode spectral responses



Alkali photocathodes



III-V semiconductor photocathodes

Materials options: Cs-Te, Cs-Sb, Multialkali, GaN

Cathodes can be grown at ANL: Cs-Sb, K_2CsSb currently,

Need to purchase Te source for Cs-Te deposition