

Assignment - Electrostatics III

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Electron (cold) field emission

Electrons that leave a cathode will experience the potential due to the image charge in the electrode and also due to the external electric field (E_0). The external electric field lowers the resultant potential by the amount $\Delta U(E_0)$. If we neglect tunneling and thermionic emission, electrons at the cathode will begin to leave the electrode once the resultant potential tip will be lower than the electron work function (φ) in the electrode.

- Find $\Delta U(E_0)$ - ?
- Determine the threshold value of the electric field (E_{th}) at which $\Delta U = \varphi$
- Estimate E_{th} for the copper electrodes.
- Which metals will provide lower E_{th} ?

