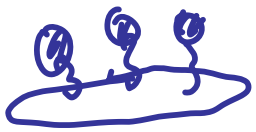
- Announcements
  - No lecture Thursday
  - Talks R + F, Evals/Party T (16-336)
- Last Lab Quiz
- Pre-lab Lecture
  - ECD Design
  - ECD Gel Layer
  - Today in Lab

ECD Applications + Design

- Applications
  - Light-responsive windows, helmets, etc.
  - Electronic paper
- Key design parameters
  - switch speed
  - color contrast
  - transparency
  - flexibility
  - durability → chem., mech., state
  - footprint → chem., recyclable, power

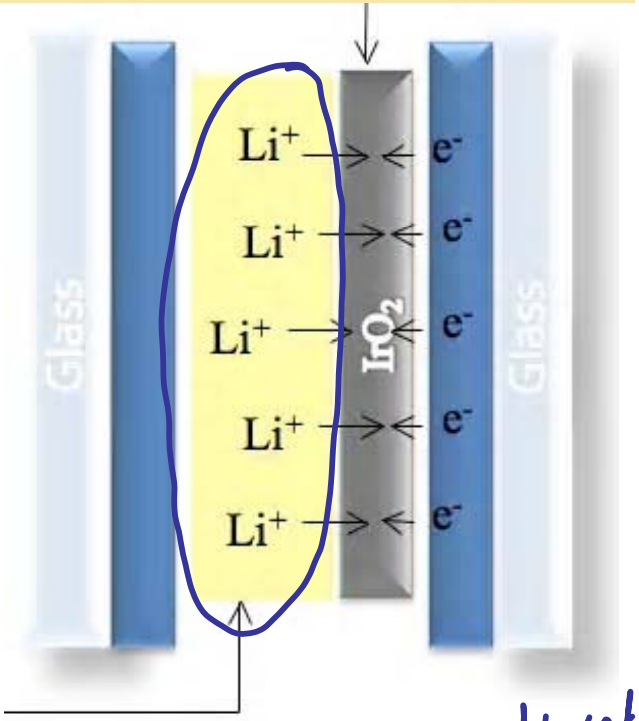


nanowires → packing uniformity + density } Lw
adhesion to ITO

On/Off Switch Speed

- Redox reaction drives ECD
  ox – dark
  red – light
- Investigation (+images) by Yoon-Sung Nam: identify rate-limiting steps
  - Ion or electron conduction
  - Gel or IrOx layer
  - Oxidation or reduction step
- reduction step is problematic
  - Current ↓ as rxn progresses
  - Switch time ↑ as conductivity ↓

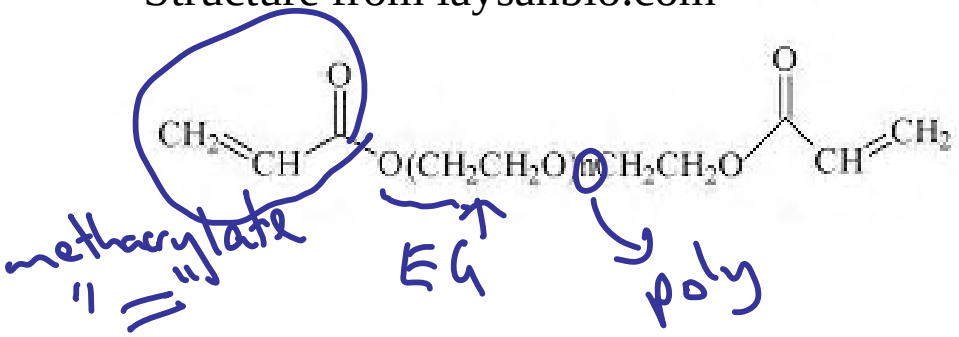
$$IrO_2 + Li^+ + e^- \underset{ox.}{\overset{red.}{\rightleftharpoons}} LiIrO_2$$



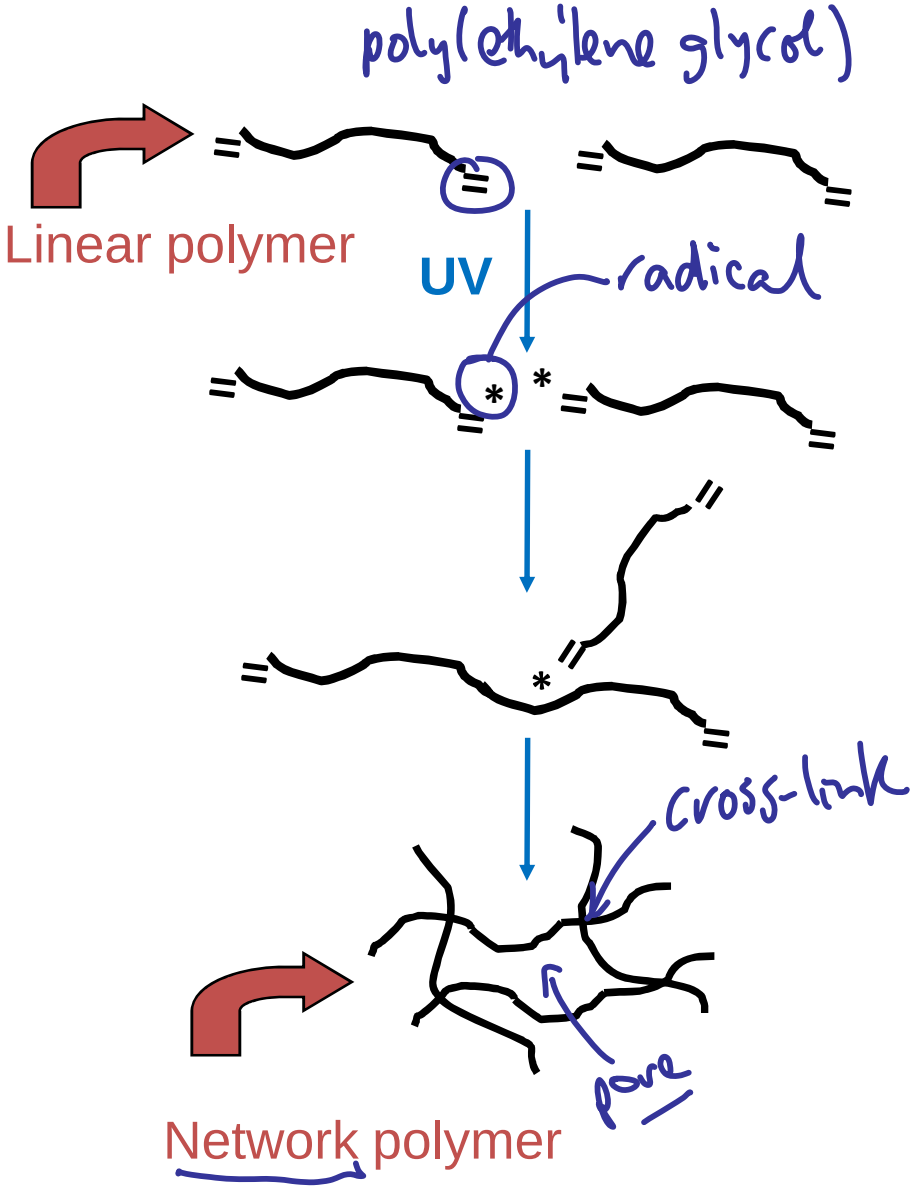
why! IrOx in reduced state is insulator

Free radical polymerization of PEG DMA

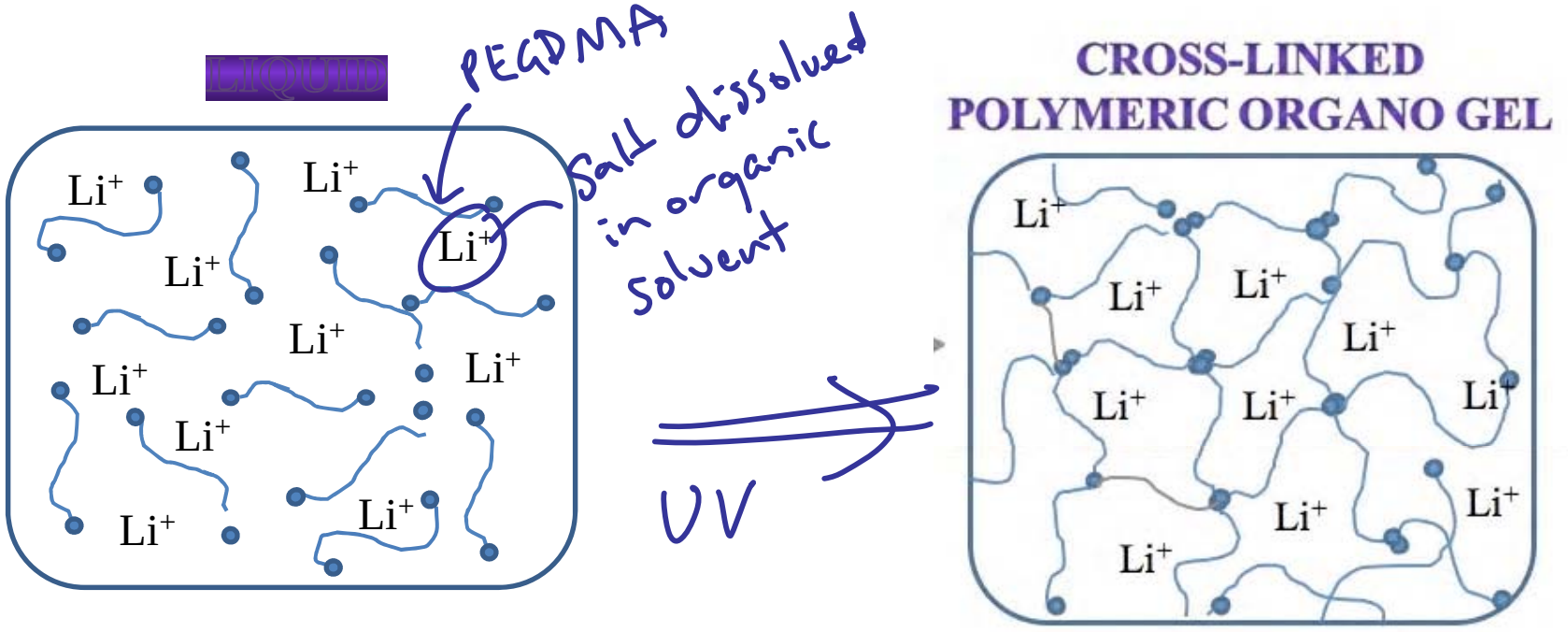
Structure from laysanbio.com



- Material parameters
  - [PEG]
  - [Initiator]
  - PEG MW
- Affect network pore size, mechanical properties, swellability, etc.



Closer look at ECD gel layer



- As PEG or initiator concentration ↑ ___ conductivity ↓ ___
- As PEG MW ↑ ___ conductivity ↑ ___

effect of network density

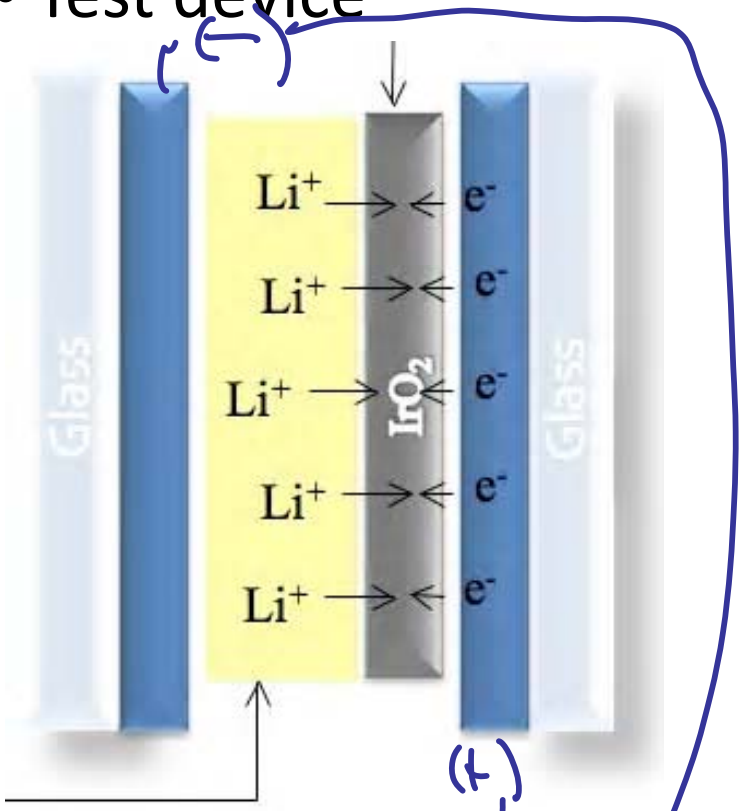
caveat: side effects on mech. properties

as Li+ ↑, conductivity ↑

Today in Lab

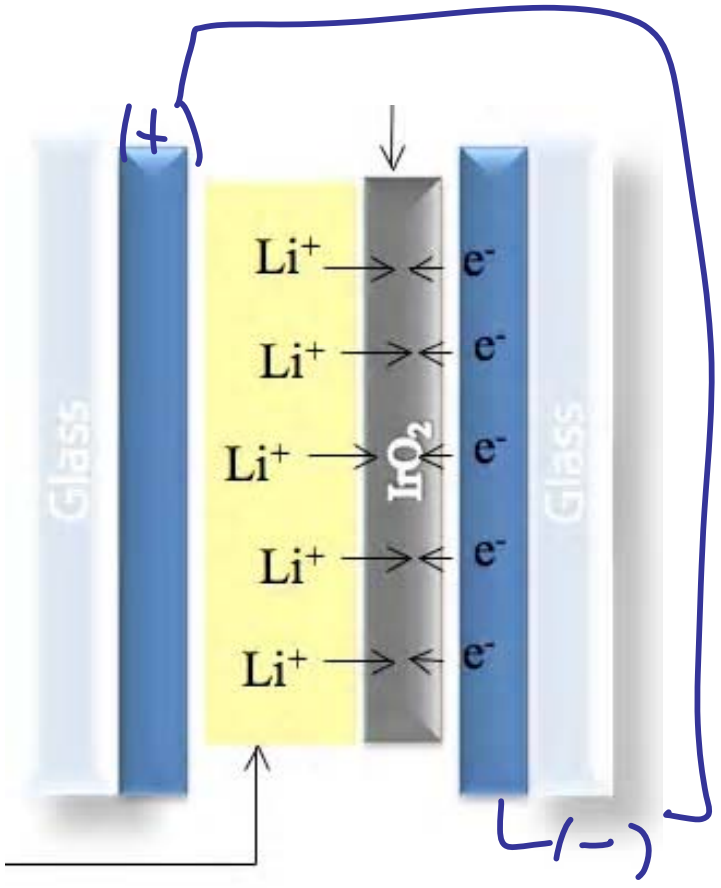
side rxn. w/ H_2O → LiOH

- Prepare device with organogel
- Test device



IrO_x (+) → oxidation

de-color



IrO_x (-) → reduction

Li+ ↓ Lt