Announcements

- Turn on the Clicker (the red LED comes on).
- Push “Join” button followed by “20” followed by the “Send” button (switches to flashing green LED if successful).

- Quiz tomorrow on electrochemistry including electrometallurgy
- Wear clothes you do not care about to lab this week.

Review

- Electrolysis and recharging batteries.
  - Any pair of reactions where $|E_1-E_2|$ less than $V_{applied}$ can go.
  - RXN with highest E^o_{red} in a pair will go in reverse as an oxidation.
  - Pair with the smallest potential difference is the most likely.
  - RXNs that use species(reactants) in low concentration are not very likely.
  - Reduction of alkali metal ions (K^+, Na^+, etc) to metal is unlikely since the metals reoxidize with water to form $M^+ + OH^- + H_2(g)$
  - RXNs that produce gases have an **overpotential,** so go very slowly without a significantly larger potential difference than the one expected from reduction potentials.
- Proton Exchange Membrane Fuel Cells and low emission vehicles.

Materials (metals & polymers)

- Electrometallurgy (Cu & Al)
- Ore purification (smelting Cu & Fe, Al_2O_3 from bauxite)
- Physical properties of metals
- Modification of metal properties: work hardening, alloying and annealing.
- Addition versus condensation Polymers
- Macroscopic Polymer properties from inter- and intra-molecular interactions

Electrolytic Refining of Cu

Chang Figure 19.20

Electrolytic Refining of Al

Chang Fig. 19.19

Figure 18.8 in
Chemistry by Gilbert *et al.*

Periodic table showing metals, metalloids and non-metals

Properties of Metals

- good conductors of electricity and heat
- malleable (can have their shape changed)
- ductile (can be pulled to thin wires)
- high lustre (shiny, reflect light)

Electron Sea Model of a metal from Chang Fig. 12.23

Cartoons of dislocations in metal crystals

Gilbert Figure 18.4

Humps in rug as an example of how dislocations can pin each other in place and prevent relative motion of atoms in a crystal

Gilbert Figure 18.5