ELECTROCHEMICAL CELLS "galvanic" "voltic" cells

Use a spontaneous redox reaction

Chemical $E \rightarrow$ electrical energy

Cathode

Anode

Zn

Cathode

Anode

Scale bridge

Cathode

Anode

CROAK

Oxidized $Zn^0 \rightarrow Zn^{2+} + 2e^-$  $Cu^{2+} + 2e^- \rightarrow Cu$  Reduction

Overall reaction $Zn + Cu^{2+} \rightarrow Zn^{2+} + Cu^0$

Zn electrode is losing mass, $[Zn^{2+}] \uparrow$

Cu electrode is gaining mass, $[Cu^{2+}] \downarrow$

Electric current flows through the wire from the anode to the cathode because of a difference in reduction potential (force)

Pull on the electrons $\rightarrow$ measured as VOLTAGE

Voltage $\rightarrow$ current $\rightarrow$ electrical potential

Cell notation anode | Zn $\uparrow$ | Zn$^{2+}$ || $Cu^{2+}$ | cathode

04.08.2013 12:23p 4/8/13, 9:06 AM, 39m 17s
**Electrochemical Cells**

- Galvanic cells
- Voltaic cells
- Use a spontaneous redox reaction
- Chemical $E$ to electric energy

**Diagram:**
- Anode
- Cathode
- Electrode
- Overall reaction: $\text{Zn}^0 + \text{Cu}^{2+} \rightarrow \text{Zn}^{2+} + \text{Cu}^0$
- Zn electrode is losing mass, $[\text{Zn}^{2+}]$ ↑
- Cu electrode is gaining mass, $[\text{Cu}^{2+}]$ ↓
- Electric current flows through the wire from the anode to the cathode because of a difference in reduction potential (force)
- Pull on the electrons → measured as voltage
- Voltage → emf → electrical potential

**Cell notation:**
- Anode || Cathode
- $\text{Zn} | \text{Zn}^{2+} \ || \text{Cu}^{2+} | \text{Cu}$
\[ E_{\text{cell}}^0 = E_{\text{cathode}}^0 - E_{\text{anode}}^0 = 0.34 \text{V} + 0.76 \text{V} \]
\[ E_{\text{cell}}^0 = 1.10 \text{V} \]

\[ \text{Mg} | \text{Mg}^{2+} \ || \text{Pb}^{2+} | \text{Pb} \]
\[ \text{Mg}^0 \rightarrow \text{Mg}^{2+} + 2e^- \quad E_{\text{cell}}^0 = -0.13 \text{V} - -2.37 \text{V} \]
\[ 2e^- + \text{Pb}^{2+} \rightarrow \text{Pb} \quad E_{\text{cell}}^0 = 2.24 \text{V} \]

Br₂ (s) is dripped into an aqueous mixture of NaCl + NaI. What happens?

In the dish: \[ \text{Na}^+ , \text{Cl}_2 , \text{I}^- , \text{Br}_2 \]