Isotope Electrochemistry

Fractionation equation

\[ \ln \alpha^{l-k}_{\text{electrochemical}} \propto \frac{\ln \alpha^{l-k}_{\text{eq}}}{2\lambda} ze(V_{\text{appl}} - V_{\text{eq}}) \]

\[ \ln \alpha \text{ positive} \]

\[ \ln \alpha \text{ negative} \]

Kavner, et al. 2005
\[ \ln \alpha = \frac{1}{\lambda} \]

\[ \Delta_{66}^{\text{Zn}} (% \text{ wrt starting solution}) \]

\[ V_{\text{appl}} - V_{\text{eq}} (V) \]

\[ \text{Fe data} \]

\[ \text{Zn data} \]

Prediction: \( \ln \alpha \) negative (in agreement with Schauble et al., 2003)
**Electrochemical Observations**

**5 Volts. Pressure in center ~ 1 Gpa (10 kb)**

- **10 seconds** - Iodine begins to form in middle.
- **5 minutes** - Iodine is clearly forming and silver dendrites form on left electrode.
- **10 minutes** - Iodine is clearly more concentrated and dendrites more distinct than at 5 min.

**5 Volts. Pressure in center ~ 2-3 Gpa (20-30 kb)**

- **0 minutes** - The phases have spread out in the cell due to increased pressure. Note that the brown area is the intermediate (IV) phase.
- **5 minutes** - The Iodine is clearly forming over a larger area. Silver dendrites are seen near the bottom electrode in the phase IV.
- **10 minutes** - Silver dendrites and Iodine continue to form. However, the Iodine appears less concentrated than at 1 Gpa (above).