

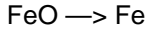
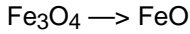
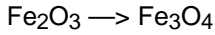
Free Enthalpy of Reduction or Oxidation Processes

Illustration

This module augments the advanced module "[Free Enthalpy of Reduction Processes](#)". It shows in particular the free enthalpy gain vs. temperature diagram in more detail. Most everything of interest is explained in the advanced module. Smelting, i.e. the reduction of the oxide, only occurs if the reaction line is above the carbon monoxide line since it is the difference in energies that counts.

Here I only want to point out a few things:

- Iron oxide reduction runs in [several steps](#):



Together it takes far more energy to generate iron (Fe) than, for example, copper (Cu).

- The final step, the reduction of FeO, only gains energy by transferring the oxygen to the carbon monoxide above about 750 °C. FeO melts before Fe does.
- Smelting lead (Pb) or zinc (Zn) takes more energy than smelting copper, despite their low melting points.
- Zn produced above the smelting temperature will become completely vaporized.
- Smelting nickel (Ni) and cobalt (Co) should be easier than smelting iron (Fe).

You just as well can read the diagram "backwards" and find out, how much energy will be released if you bubble oxygen through *molten* iron, i.e. at temperatures above the red vertical line.

