

Roasting Encyclopedia Article

Roasting

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There are three basic steps in the process of converting metal ores to free metals: preliminary treatment in which the metal-containing mineral is separated from less desirable parts of the ore or in which it is transformed to a compound which is more easily reduced; the **reduction** process itself, and, finally, purification or refining.

The reduction process which produces the free metal involves heating a metal **oxide** at high temperatures with **carbon** in the form of coke. This step is known as **smelting**. A flux is sometimes used that combines chemically with the infusible materials (gangue) in the ore to form slag, which floats on top of the metal and can be drawn off.

Many metal ores such as iron(II) sulfide (pyrites), mercury(II) sulfide (cinnabar), and lead(II) sulfide (galena), or **zinc** carbonate (smithsonite) must be converted to the oxide before reduction. This preliminary step is known as roasting. For carbonate ores, this involves a simple loss of **carbon dioxide** leaving the desired metal oxide. For sulfide ores, the roasting process uses **oxygen** in a blast furnace, hearth furnace, or Bessemer converter to convert the metal sulfide into the metal or the metal oxide plus **sulfur dioxide**. In the past, the evolution of sulfur dioxide from roasting facilities was a major cause of **acid rain**, but most sulfur dioxide is now captured and used to make **sulfuric acid**. Little **heat** is needed in the roasting of sulfide ores because the **oxidation** of the sulfide **ion** to sulfur dioxide is exothermic.