

## Measuring the Amount of Metal Carbonate in an Ore.

An ore is any naturally-occurring source of a metal that you can economically extract the metal from.

Aluminium, for example, is the most common metal in the Earth's crust, occurring in all sorts of minerals. However, it isn't economically worthwhile to extract it from most of these minerals. Instead, the usual ore of aluminium is bauxite - which contains from 50 - 70% of aluminium oxide<sup>1</sup>.

Other examples of ores are:

Malachite which contains a copper ore



Hematite which contains a iron ore



Cinnabar which contains mercury ore



Metal are extracted from their ores by several methods such as electrolysis, reduction with carbon and phytomining. The metal ores are compounds of the metal such as metal carbonates.

When a metal carbonate reacts with an acid carbon dioxide gas is produced. Scientist use simple chemical test to measure the amount of metal carbonate in a rock to see if it has a high enough content to make it work extracting. They add an acid such as hydrochloric acid to the ore and measure the amount of gas released, the more gas released the more metal carbonate in the ore. This is used as an indication of where to locate a quarry to obtain ore from, or comparing ores to determine the location likely to produce the most metal.



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<sup>1</sup> <http://www.chemguide.co.uk/inorganic/extraction/introduction.html>

Below is an example of the method a scientist would use to measure the amount of metal carbonate in an ore.

### **Equipment:**

- 250 cm<sup>3</sup> beaker
- Samples of different metal carbonate ore
- 25cm<sup>3</sup> measuring cylinder
- Stopwatch
- Spatula
- Dilute hydrochloric acid 1 mole per dm<sup>3</sup>

### **Method:**

1. Measure out an amount of metal carbonate ore.
2. Place the copper carbonate ore into a 250 cm<sup>3</sup> beaker
3. Measure out exactly 25 cm<sup>3</sup> of hydrochloric acid
4. Pour the hydrochloric acid into the beaker of copper carbonate ore, start the stop clock then **swirl** once
5. When the fizzing appears to slow down swirl the beaker **once** more to make sure all the copper carbonate reacts
6. Measure the time when the fizzing stops
7. Place the remains of the copper carbonate ore solid into the waste flask
8. Wash out the beaker thoroughly with water

Another method that could be used would be to extract the metal from the ore by heating with carbon then weighing the metal extracted to see how much there is in the ore. This method extracts the metal from the ore but is more time consuming. The following link gives a method of how to extract a metal from its ore by heating with carbon.

<http://www.rsc.org/learn-chemistry/resource/res00000478/getting-metals-from-rocks?cmpid=CMP00000548>