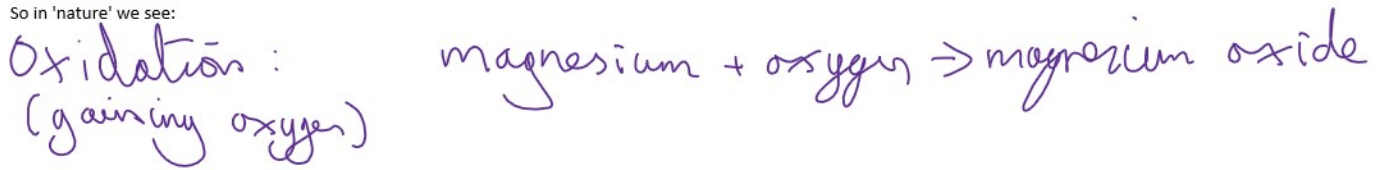


Separating Metals from Metal Oxides

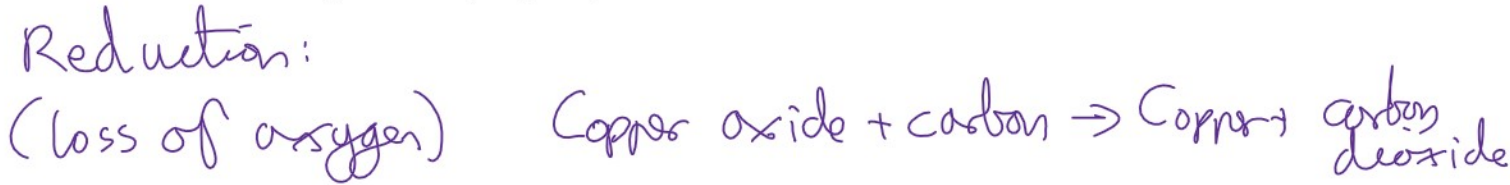
23 January 2020 09:41

Metals aren't often found as lumps in the ground. If you found a lump of metal, it was maybe gold... Which is unreactive. Most metals though are more reactive than gold and so exist in nature joined up with other elements like oxygen (and others). Separating the elements so we can get the pure metal is very important to how we live. Rocks with metal compounds in them are called 'Ores'.

So in 'nature' we see:



Which means we have to 'reduce' the magnesium oxide to get the pure magnesium.



Using Carbon to Reduce Metal Oxides

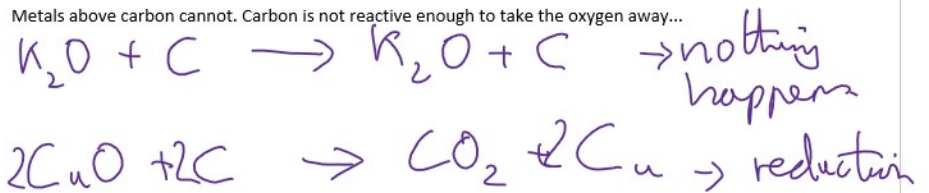
Note the language - we are reducing a compound of metal oxide by removing the oxygen. If we have a metal oxide and heat it with carbon we can reduce the metal oxide... But not always. You have to compare the position of carbon and the metal in the reactivity series. If carbon is more reactive than the metal in the metal oxide then carbon will take the oxygen away from the metal oxide - reducing it.

- Potassium
- Sodium
- Lithium
- Calcium
- Magnesium
- Carbon
- Zinc
- Iron
- Hydrogen
- Copper



Metals below carbon can be extracted from their oxides by burning with carbon in a furnace

Metals above carbon cannot. Carbon is not reactive enough to take the oxygen away...

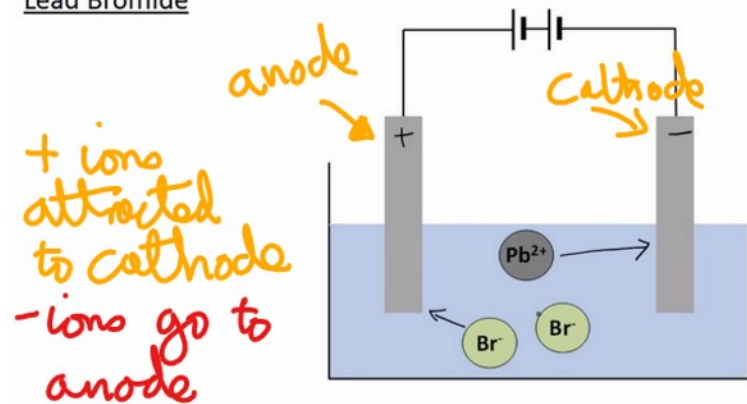


For more reactive metals you have to do electrolysis.

Electrolysis

This is where an electrical current is used to separate metals from their compounds. Current is the flow of charges, either positive or negative. So for electrolysis to happen you have to have ions that are free to move. So you can't usually do electrolysis of solids. You either have to melt the compound or dissolve it in water so the ions can move.

Lead Bromide

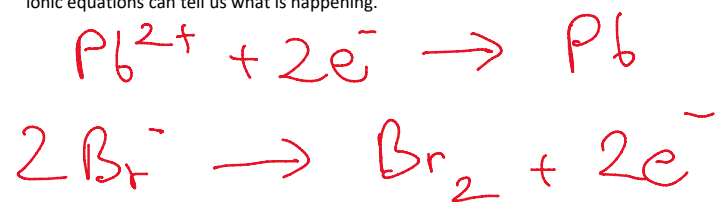


Nasty, nasty chemicals!!!

ugh...

Imagine for the moment that lead bromide is melted and then we do electrolysis on it. After a few minutes the cathode will change colour as it is coated with lead. At the anode bubbles of bromine gas will come off. So you have separated the lead bromide into lead and bromine. Since there is no water you get nothing but the elements. At each electrode ionic equations can tell us what is happening.

Imagine for the moment that lead bromide is melted and then we do electrolysis on it. After a few minutes the cathode will change colour as it is coated with lead. At the anode bubbles of bromine gas will come off. So you have separated the lead bromide into lead and bromine. Since there is no water you get nothing but the elements. At each electrode ionic equations can tell us what is happening.



While this is a simple method that works well it is very expensive to do because you need a lot heat and supply electrical currents. So it is used when the carbon method above can't be because the metal is very reactive.

You need to know about Bauxite - an ore that contains Aluminium oxide. As you can see its a very exciting looking material found in the ground. But without this piece of dull looking rock there would be no aluminium and so no planes, iPhones etc etc etc. Dull but very important! Look up the reactions in your text book or notes....

