Copper Refining: Teacher Notes

Recycling

The energy required to make recycled copper is only 20% of that needed to make ‘new’ copper from ores.

Purity

The process may appear to be a lot of trouble for an apparently small increase in purity from 99% to 99.995%, but 99.995% pure copper is required to achieve the conductivity needed for electrical cables.

Using the slag

The sale of the slag as an abrasive makes a significant contribution to the economics of the process.

Blister copper

The video clip shows the recycling of scrap copper, but occasionally ‘new’ copper which has been extracted from copper ores is used when there is a shortage of scrap. This copper is called ‘blister copper’ and is imported from a variety of sources including South America, Scandinavia and South Africa. It is 98–99.5% pure and is added to the process at the stage of the anode furnace.

Treatment of the electrolyte

During electrolysis, both copper and nickel (present in the scrap) dissolve from the anodes but only copper plates on to the cathodes under the conditions used. The electrolyte thus becomes a mixture of copper sulfate and nickel sulfate. The electrolyte is removed and electrolysed with a lead anode and copper cathode to remove the copper and leave an impure nickel sulfate solution. Water is removed from this by vacuum evaporation to leave impure solid nickel sulfate which is sold and can be used for nickel plating *etc*.

Removing the copper

This process is called ‘stripping’. The sides of the steel cathodes are protected by plastic strips, and the bases of the cathodes by a coating of wax. This prevents copper depositing around the sides and bases of the cathodes and makes the copper coating easier to remove.