





# **COPPER: NEVER ENDING RECYCLING**

## How to recover copper from electrical circuits

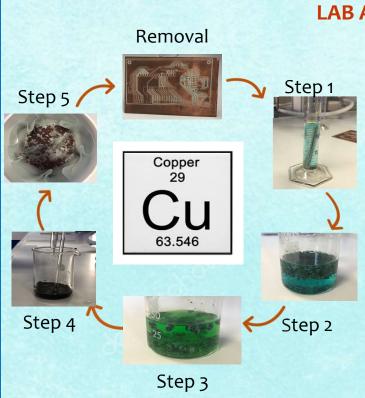
Alessia Giannavola, Cecilia Valle

#### INTRODUCTION

Electronics waste is what we generate from broken electronic devices. Copper recycling may minimize environmental impact, lower energy consumption, or reduce use of precious natural resources in the future.

#### THE GOAL

The purpose of experiment is to recycle this metal: obtaining pure copper from a computer motherboard through some chemical steps. It explores the role of copper products in meeting present and future social needs.



### LAB ACTIVITIES

Remove the green layer over the PCB (printed circuit board) using a piece of sand-paper.

Step 1 - Oxidizing Cu with concentrated nitric acid, HNO<sub>3</sub>

 $3 Cu_{(s)} + 8 HNO_{3 (aq)} \rightarrow 3Cu(NO_3)_{2 (aq)} + 2NO_{(g)} + 4H_2O_{(I)}$ 

Step 2 Precipitating Cu(OH), with NaOH

 $Cu(NO_3)_{2(aq)}+2 NaOH_{(aq)} \rightarrow Cu(OH)_{2(aq)}+2NaNO_{3(aq)}$ 

Step 3 Converting solid Cu(OH)<sub>2</sub> to solid CuO

 $Cu(OH)_{2(aq)} \rightarrow CuO + H_2O_{(I)}$ 

Step 4 Dissolving CuO with sulfuric acid, H<sub>2</sub>SO<sub>4</sub>

 $CuO_{(s)} + H_2SO_{4(aq)} \rightarrow CuSO_{4(aq)} + H_2O_{(I)}$ 

<u>Step 5</u> Reducing Cu<sup>2+</sup> ions with Zinc metal

 $CuSO_{4(aq)} + Zn_{(s)} \rightarrow ZnSO_{4(aq)} + Cu_{(s)}$ 

## **REMARKS**

The life of copper is endless. It can be recycled over and over with no loss of properties. At the end of these series of reactions the yield of the chemical extraction was very high. We completely achieved the goal of our experiment, i.e. recycling copper so to use it in a different way, without wasting a bit of it.

