

## For Teachers Renewable Keratin wastes for use in metal mining

### Module 5

**Objective: To verify if it is possible to build a container to use for growing plants in soil contaminated with heavy metals.**

#### Introduction





The raw or recycled wool showed good adsorbent capacity and it could therefore be used to allow nursery-garden or horticultural cultivation in soil that is contaminated with heavy metals.

#### Necessities



##### List of materials/tools

- 3 Beakers
- 1 perforated container
- Porcelain capsule
- Pliers
- Gloves
- Safety Glasses

Reagents	Formula		Quantity (g) or Concentration (M)
Coarse Wool's solution in NaOH			
Copper (II) sulphate	$\text{CuSO}_4$		$\text{CuSO}_{4(aq)}$ 200mg/l
White wine vinegar			
H <sub>2</sub> O distilled			
2 Test strips for dosing copper			

#### Lab Procedure

- The washing has the purpose of eliminating the sodium hydroxide and to bring back the pH to neutrality.
- Let the jar dry in the air.  
*It is necessary to wait between 1 and 2 weeks; after some days, when most of the liquid has evaporated, it would be better to extract the pot from its mould in order to simplify the drying process. It's possible to accelerate the drying process using a stove at a not very high temperature.*
- Put the pot into a beaker and add some ml of copper (II) sulphate. Wait for a few hours.
- Observe possible colour variations of the wool's little base.
- Remove the vase from the beaker and recover the solution.

## For Teachers Renewable Keratin wastes for use in metal mining

- Pour a little bit of the cupric (II) sulphate into another beaker, then dip briefly a strip to dose the copper level into each of them, wait for about 20 seconds and observe the colour variation. Because of the change of the strip colour, the variation of copper concentration when there is wool can be determined.  
This part is completely similar to that of the experience n. 4.

### Additional Safety Notes



Wear gloves and safety glasses

### Results:

Strip colour DEEP PURPLE → HIGH concentration of COPPER

Strip colour PINK → LOW concentration of COPPER

Solutions	Strip Colour	Solution concentration
Copper (II) sulphate solution	<i>Purple</i>	<i>200 mg/l</i>
Copper (II) sulphate solution Where the wool little vase was immersed		



### Questions/Quiz

- Have you observed any variations in the colour of the little vase after being soaked in copper (II) sulphate? Why?  
*In this case the variation of colour isn't easily visible because of the colour of the little vase that camouflages the colour of  $Cu^{2+}$  ions, also because of their low concentration in the solution used.*
- Calculate the quantity of copper absorbed by wool during the latency period.  
*It can be easily verified from the colour variation of the strip, comparing it with what is written on the container.*
- Plan an experiment to measure the quantity of wool necessary to absorb a specific quantity of copper, using some little vases similar to that made before.  
*It is possible to repeat the experience by making similar little vase with different quantities of wool that were weighed before being immersed in NaOH.*
- How could you verify the effectiveness of the little vase made for the cultivation of a particular type of plant?  
*You could prepare a little cultivation with plants grown in little vases using soil enriched with copper.*