

For Teachers Renewable Keratin wastes for use in metal mining

Module 1



Objective: KERATIN EXTRACTION FROM WOOL

Introduction

Keratin is a filamentous protein with a quaternary structure. It is rich in sulphur and it is very stable and resistant. It is found in nail, skin, hair and horns. In this experiment we are going to extract keratin starting from wool. This can be done using an extraction solution (*NaOH 1.0N/NaOH 0.5N*).

Necessities



Reagents	Formula		Quantity (g) or Concentration (M)
Sodium Hydroxide	NaOH		1.0/0.5 M

List of materials/tools

- Coarse wool fibres: wool must be coarse, untreated and undyed in order to prevent treatments from altering the results.
- Becker
- Glass rod
- Gloves
- Safety Glasses

Lab Procedure

- Put coarse wool fibres into the beaker and cover them with the solution of sodium hydroxide. Then mix the compound with a glass rod.
Make sure that wool is completely covered with the extraction solution.
- Wait at least 4-5 hours; alternatively, a 0.5 N solution can be used: then and wait for one night.
The indicated time (at least 4-5 hours) refers to the hypothesis of a 1.0 N solution; alternately a less concentrated solution (0.5 N) can be used and wait one night.
- Pull out part of the fibres from the extraction solution and observe its aspect.

For Teachers Renewable Keratin wastes for use in metal mining

Additional Safety Notes



When you use NaOH, wear gloves and safety glasses

Results:

Wool aspect before the extraction	
Wool aspect after the period of extraction	<i>The wool takes a dark colouring and a gelatinous appearance</i>
Aspect of the extraction solution at the end of the experiment	<i>The solution which was colourless at the beginning becomes dark and murky</i>



Questions/Quiz

- Do you think that a chemical reaction which has modified the wool in some way has occurred?
The changes observed in terms of colour variation, solution turbidity, and of aspect of the fibres indicate that some chemical reactions did occur
- Can you imagine what kind of changes might have occurred at molecular level?
By extracting keratin with NaOH denaturation with partial protein degradation occurs. Keratin can be extracted without degrading it, however the extraction process is quite long, so it is difficult to carry it out in the laboratory. Non-degradative extraction is carried out using sodium metabisulfite (which breaks the bridge bonds of sulphur) and urea (denaturing agent).