



# TESTING OF PLASTICS



**DemEcol22**

Democratic participation and Ecology: Project to develop European consciousness and democratic behaviour in a sustainable environment



**Erasmus+**





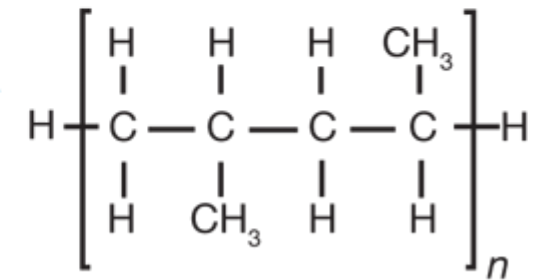
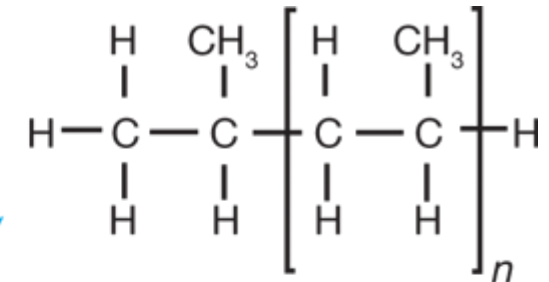
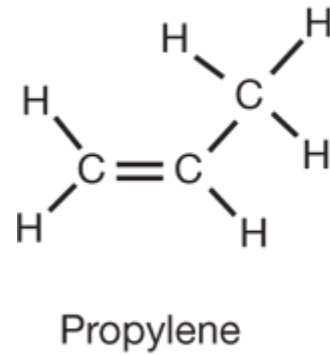
Hi! My name is Gréti and I'm here with Lilla.

# Plastics in general

- What is plastic?
  - a plastic material is any of a wide range of synthetic or semi,synthetic organic solids
  - plastics are usually organic polymers of high molecular mass
  - they often contain other substances
  - they are usually synthetic but many are partially natural

# Production of plastics

- Monomer  $\longrightarrow$  polymer
  - polymerization
  - polycondensation
  - polyaddition
- Polymers
  - Elastomers
  - Plastics
    - Thermo plastics
    - Thermo setting plastics



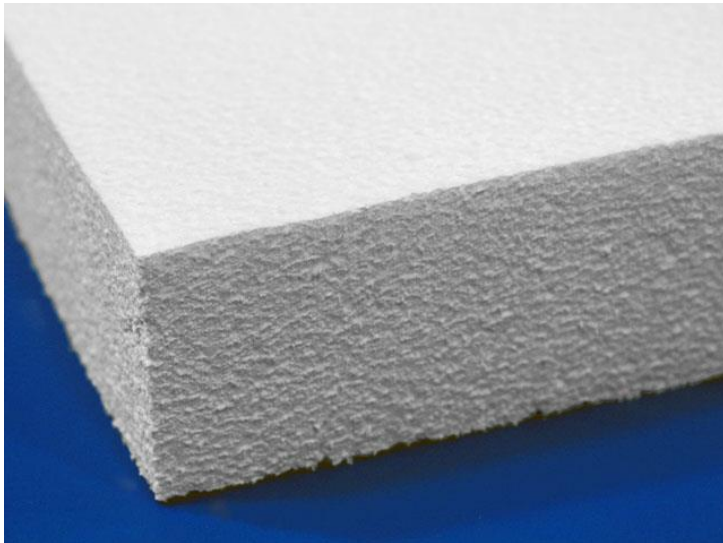
# THERMO PLASTICS

- Can be softened by heating
  - hardened by cooling
- Possible to reshape them by means of heat and pressure
- Can be reused
- PVC, polystyrene, polyethylene etc.





- Application of thermo plastics
  - Cover electrical machines, tubes
  - Insulation of electrical cables
  - Ropes, belts



# THERMOSETTING PLASTICS

- Originally soft/liquid
- Or soften once upon heating
- They harden permanently
- 127°C - 177°C
  - They set permanently
  - Further application of heat doesn't affect them
- Above 343 °C the charring occurs

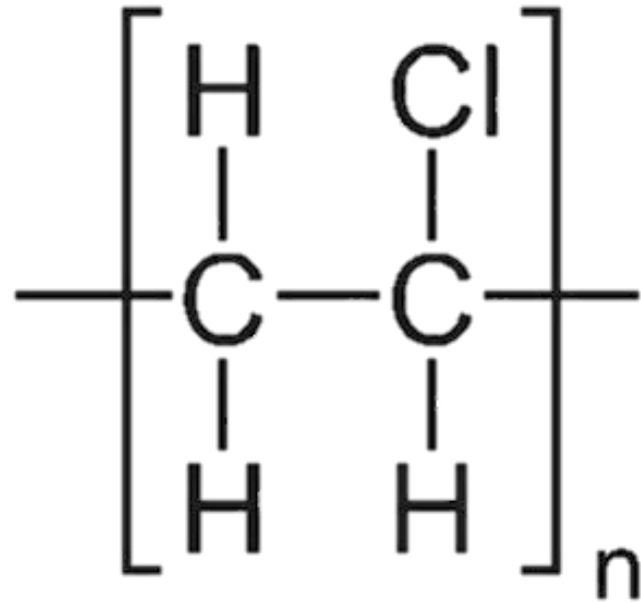
- Application of thermosetting plastics
  - Sheet molding compounds
  - Insulating foams, mattresses, coatings, car parts
  - bakelite





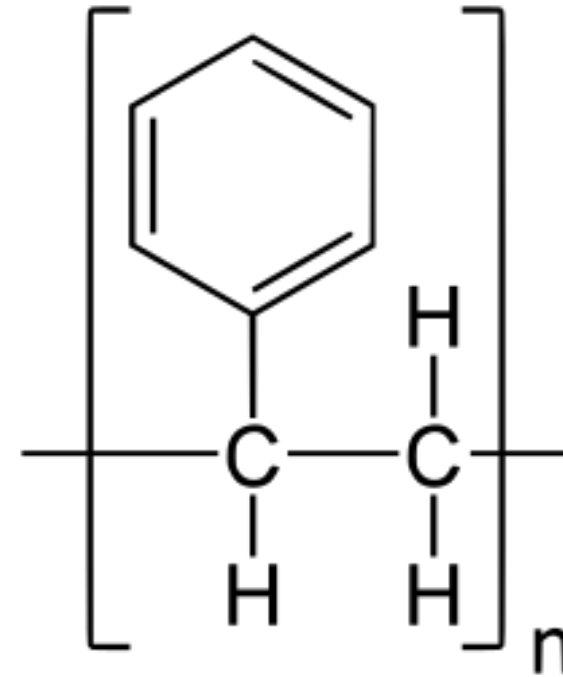
# PVC

- Polyvinyl chloride
  - The third most widely produced plastic
- It can be made softer and more flexible by the addition of plasticizers
- Used in construction
  - More effective than copper, iron or wood
- Also used in
  - Clothes
  - Upholstery
  - Electrical cable insulation
  - Window/ door frames
  - pipes



# POLYSTYRENE

- Can be solid or foamed
- Made from the monomer known as styrene
- Low melting point
- One of the most widely used plastics
  - Several million tonnes/year
- Used for
  - Protective packaging
  - containers, lids, trays
  - Phonograph records



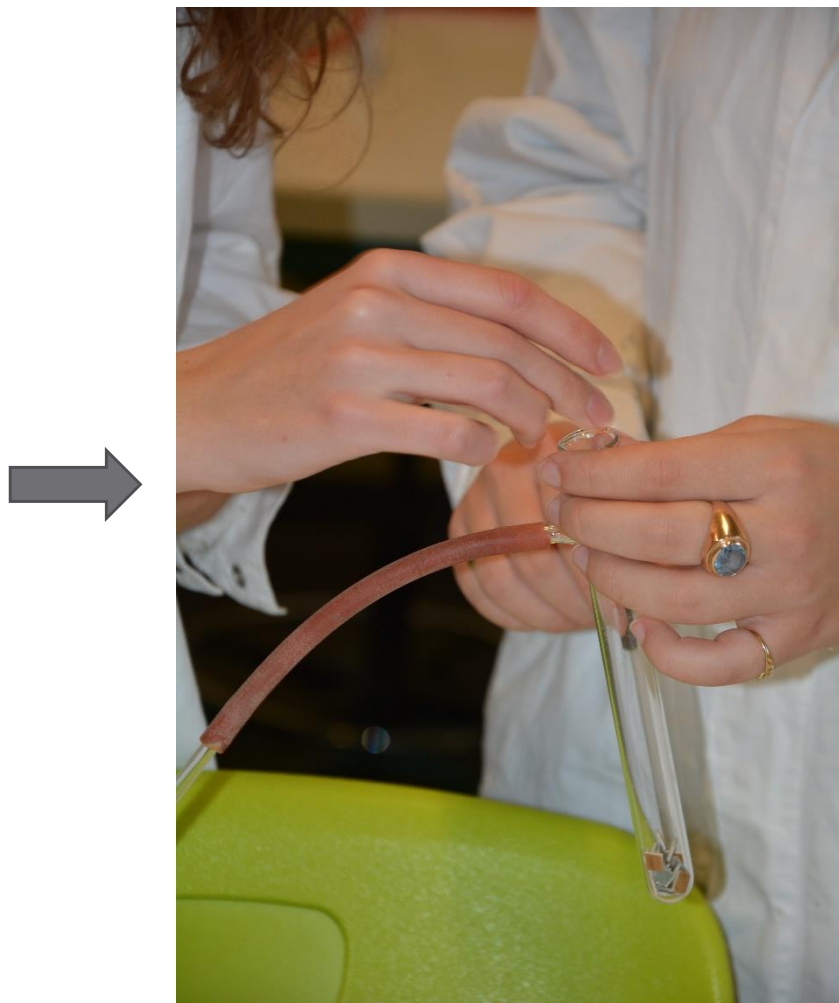
# PVC EXAMINATION

- (1) pour PVC pieces into a dry test tube.
- (2) Close the test tube with a single-hole cork stopper, in which there's a glass tube bent twice at right angles.
- (3) Heat the PVC with a gradually increasing flame, guide the flames into a silver-nitrate solution.
- (4) Keep the wet universal indicator paper in the way of the gases.

(1)



(1)(2)



(3)



(3)



(4)





- **Observation**

- White precipitate is formed
- the universal indicator becomes red

- **Explanation**

- the PVC decomposes on exposure to heat.
- Hydrochloric acid gas produced at the time of decomposition is detectable with indicator paper and silver nitrate solution.
- $\text{HCl} + \text{AgNO}_3 \rightarrow \text{AgCl} + \text{HNO}_3$  (white precipitation)
- $\text{HCl} + \text{H}_2\text{O} \rightarrow \text{Cl}^- + \text{H}_3\text{O}^+$  (acidic pH)

# POLYSTYRENE TEST

- (1) Put a piece of polystyrene in a dry test tube.
- (2) Close the test tube with a single-hole cork stopper, in which there is a glass tube bent twice at right angles.
- (3) Gently heat the test tube
- (4) Lead its end into bromine water.

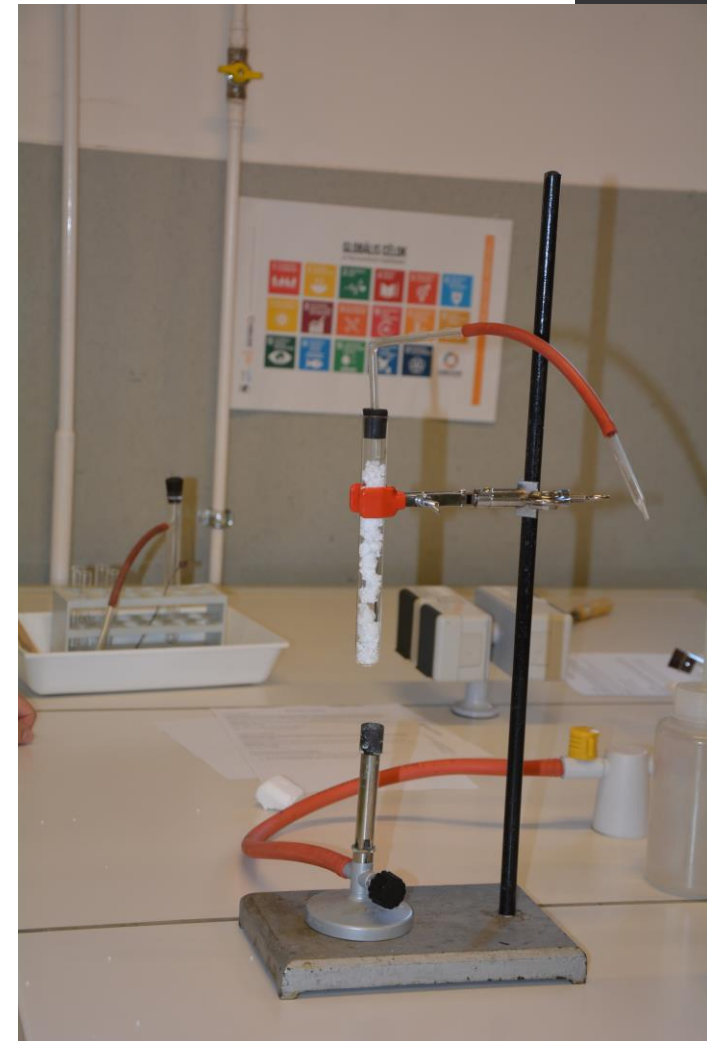
(1)



(2)



(3)



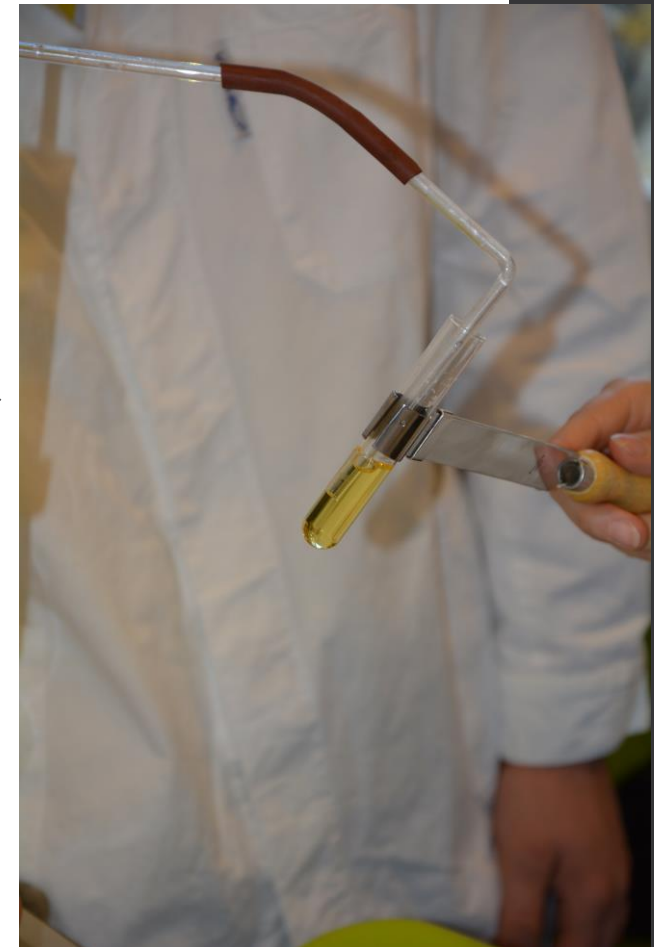
(4)



(4)



Final result



- **Observation:**

- During heating the polystyrene remains colourless, its decomposition product discolors the bromine water.

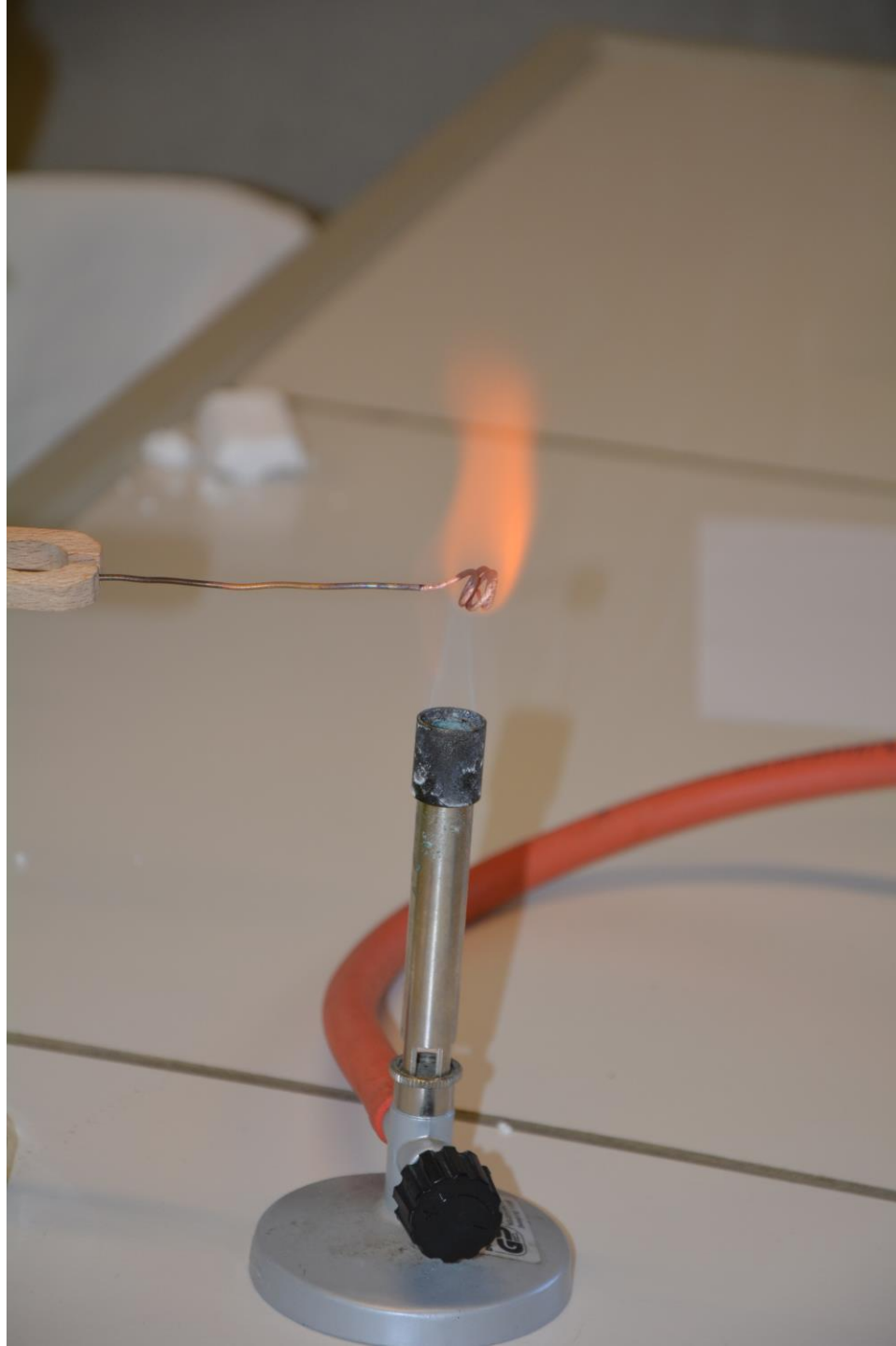
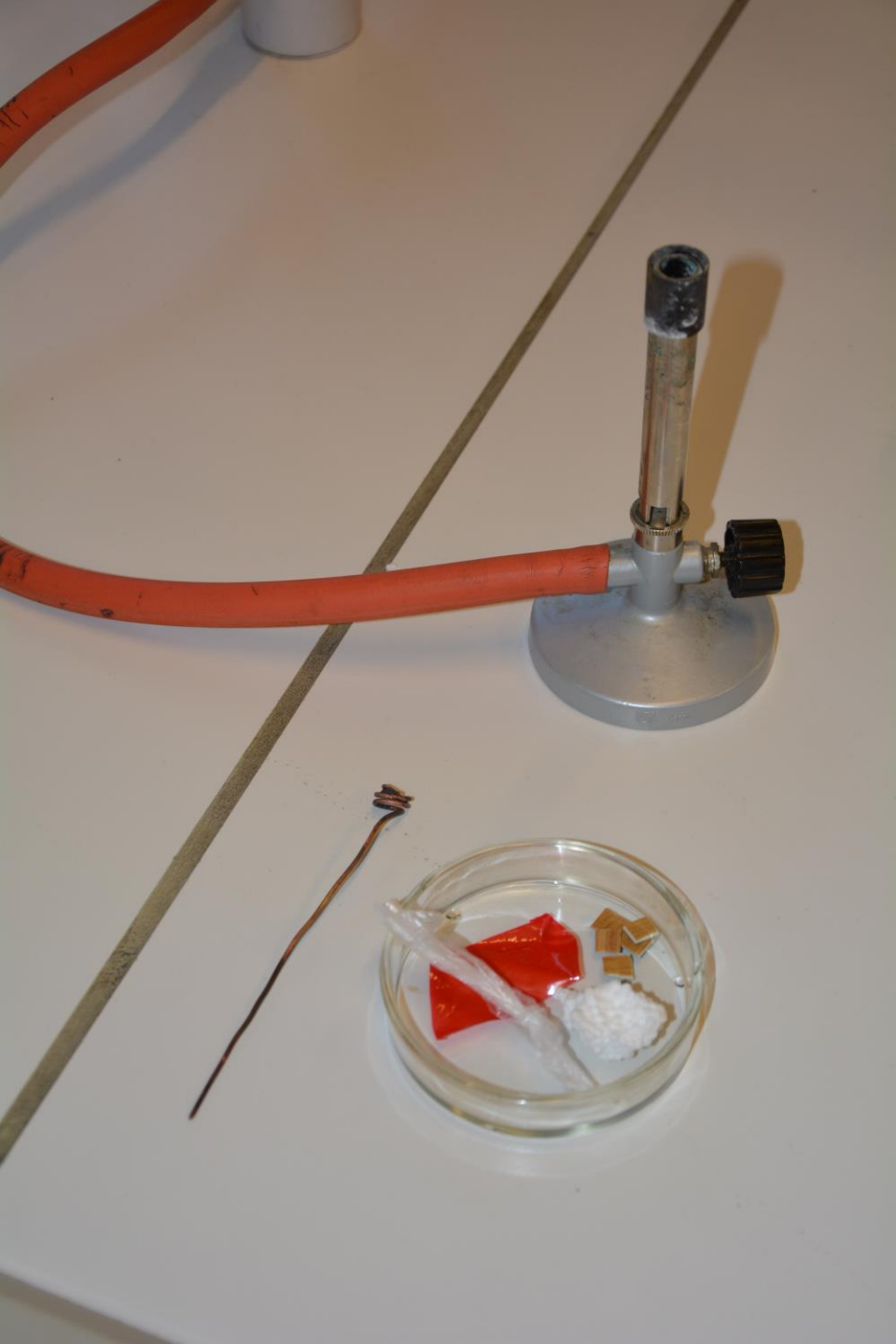
- **Explanation:**

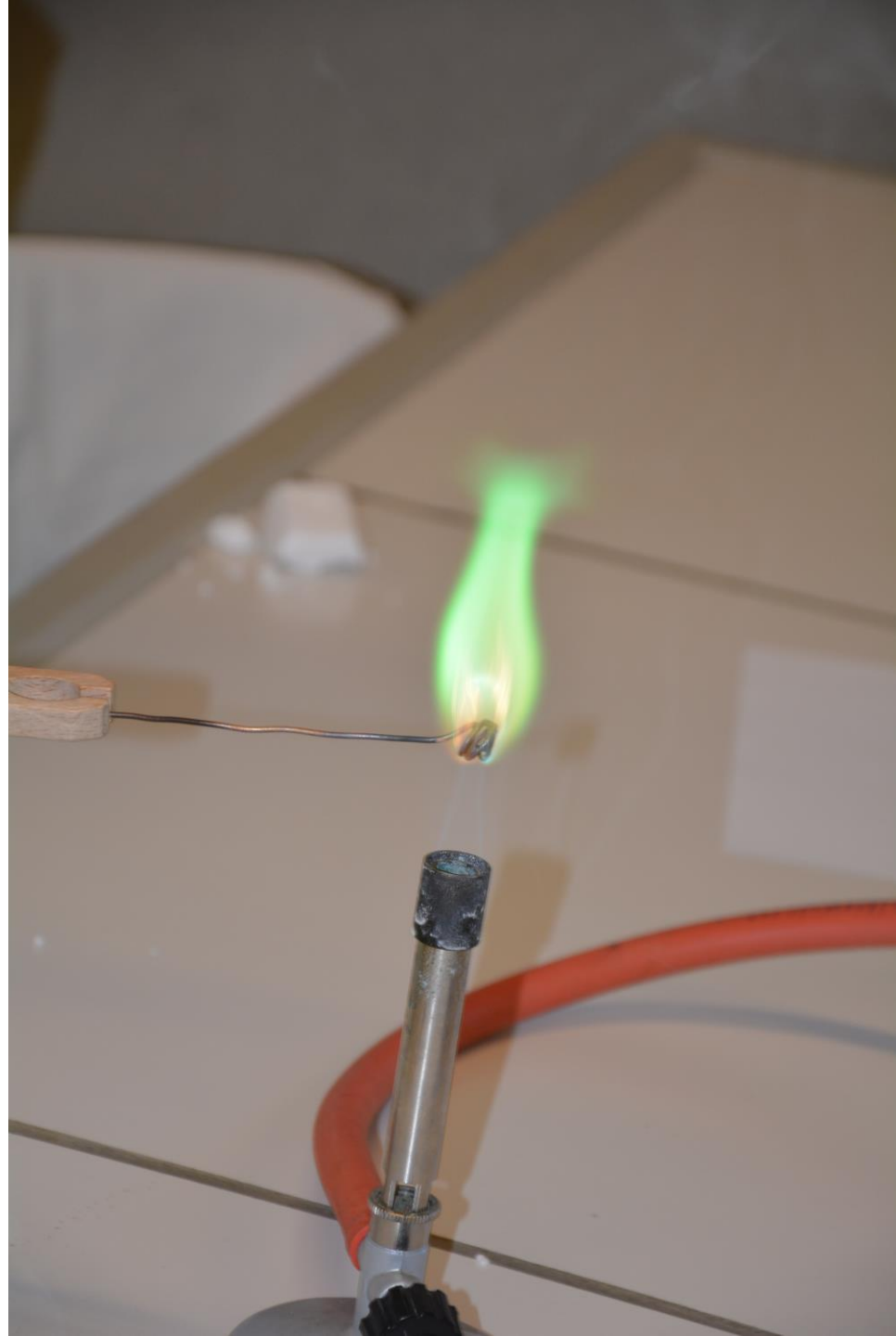
- The polystyrene depolymerizes at about 150 °C and is converted back into styrene.
- The unsaturated binding of styrene adds to bromine.
- $C_8H_8 + Br_2 \rightarrow C_8H_8Br_2$



# DETECTION OF CHLORINE IN PLASTICS

- Touch the incandescent copper wire to the test plastic and hold it into the Bunsen-burner's flame.
  - If the plastic contains chlorine (e.g., PVC), green flame painting is visible.
  - If there is no chlorine in the plastic, the flame painting is yellow.





# THANK YOU FOR YOUR ATTENTION!!



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