

# Sound: Phosphorus and Potassium Chlorate

Avert your eyes, mere mortals!

## Chemicals and Equipment Needed

- Sound Kit - O4
  - Red phosphorus
  - $\text{KClO}_3$
  - Dedicated hammer
  - 2 dedicated microspatulas
    - Red = phosphorus
    - White =  $\text{KClO}_3$
  - Ceramic mats
  - Welding blanket

## Hazards

- This is a very vigorous reaction. Using too much of the reactants can be dangerous
- Sparks from this reaction may cause burns. Rinse affected area with water and seek medical attention as needed.

## Preparation

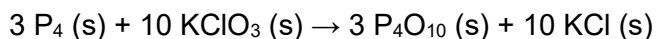
- Spread welding blanket out and set the ceramic mats on top

## Presentation

- Use a microspatula to place a pea-sized pile of red phosphorus on the ceramic mat. Use a second spatula to sprinkle some potassium chlorate on top of the phosphorus. Be careful, as these compounds are easily ignited via friction.
- Use the hammer to gently tap the mixture. A sharp loud report and sparks result from the rapid chemical reaction.
  - If tapping fails to produce a reaction, try striking the mixture away from you with the hammer, as though you are striking a match

## Discussion

- Some reactions are so highly exothermic as to be explosive. The energy produced leads to the rapid expansion of gases (air in this case) at the reaction site (the confined space between the hammer and the board) producing the loud report.



- Red phosphorus and potassium chlorate are the ingredients of the head and strike surface, respectively, of the modern safety match.
- You can include a brief discussion of the various forms of energy at this point, by pointing out that the demonstration produced energy in the forms of heat, light, and sound. The reaction conditions are different when you strike a safety match; there is no explosion, but energy is still produced in the form of light and heat. Energy cannot be created or destroyed, but it can be observed and converted into different forms.

**Clean-Up**

- After the reaction is complete, there should be little material left. It can be scraped off with a spatula. Washing the ceramic tiles is not advised, because they take a long time to dry.
- Replace the ceramic mats as needed.

**NOTES:** The potassium chlorate acts as the limiting reactant for this reaction, so you can control the vigorousness of the reaction by varying the amount of potassium chlorate.