Spontaneous Combustion Potassium Permanganate and Glycerine

Purpose

To demonstrate spontaneous combustion and the effect of increased surface area on the rate of a chemical reaction.

Materials

100 mL mortar and pestle

spatula

2 droppers

potassium permanganate

glycerine

Procedure

1. Using a mortar and pestle, slowly grind another 5.0 grams of $KMnO_4$ to a **fine** powder. Place the protective shield under the mortar on the bench for protection.
2. With a spatula, form a depression in the center of the pile.
3. With a dropper, add about 5 drops of glycerine into the depression of the pile.
4. After a few seconds, a white puff of smoke is produced, followed by crackling, sparking and a purplish flame.
5. Combustion will continue until the glycerine is consumed.
6. The product is a grayish solid with green regions.

Additional Information

1. The more finely ground crystals, the faster the reaction occurs.
2. Handle the potassium permanganate with great care. Explosions will occur if it comes into contact with organic material.
3. $14\ KMnO_4\ (s) + 4\ C_3H_5(OH)_3\ (l) \rightarrow 7\ K_2CO_3\ (s) + 7\ Mn_2O_3\ (s) + 5\ CO_2\ (g) + 16\ H_2O\ (g)$
4. Manganese oxide is black and potassium carbonate (K_2CO_3) is white. Other products must be formed. Addition of water yields a dark greenish solution and an insoluble solid. The green color may be due to potassium manganate (K_2MnO_4) and the dark insoluble solid contains Mn_2O_3 and/or MnO_2.
5. In the event the fire becomes too large, douse with water or sand.

Disposal

The solid can be placed in a properly labeled solid waste container.

Reference

Haight, G.P, Phillipson, D., Journal of Chemical Education, 1980; 57, 325