

A New Method for Starting Thermite Reactions

O. C. Klein and M. J. Copley

University of Illinois, Urbana, Illinois

Combustible mixtures are used frequently in lecture demonstrations in High School and Elementary College Chemistry. The ignition of such mixtures often involves considerable danger to the operator. This is particularly true in the case of thermite reductions and such mixtures as potassium chlorate and sugar.

The usual procedure for setting-off a thermite reaction is to place the ignition powder, consisting of an intimate mixture of powdered aluminum and barium peroxide, on top of the charge and to ignite by burning a strip of magnesium ribbon embedded in the ignition powder. At best, this method does not give the operator much time to retreat to a safe distance; however, its most serious disadvantage lies in the fact that when the magnesium ribbon is being ignited, a glowing piece of it may melt off at the top, fall on the ignition powder, and set it off while the operator's hands are directly over the crucible. Many serious burns have been caused in this manner.

This hazard may be eliminated by substituting for the magnesium ribbon a potassium permanganate-glycerine mixture. About 0.25 gr. of dry potassium permanganate is finely powdered in a porcelain mortar. This powder is placed in a heap on top of the ignition mixture. A small crater is made in it and into this is added one drop of glycerine from the end of a glass rod or a piece of small bore tubing. After a short time a vigorous oxidation of the glycerine by the permanganate occurs, which soon ignites the mixture of powdered aluminum and barium peroxide. The period of time which elapses before the ignition powder is set off is governed roughly by the thickness of the permanganate layer at the bottom of the crater. A thickness of 1 mm. requires about 10 sec. for ignition to take place. The permanganate-glycerine mixture may be used with the customary one to ten barium peroxide and aluminum ignition powder.

The above method of ignition has been tried out successfully in the preparation of chromium, manganese, silicon, iron, boron, columbium and tantalum by aluminum reduction. We believe that the use of the permanganate-glycerine mixture will prevent many accidents, particularly if it is necessary to carry out the reductions in the open air, where the presence of a breeze makes it difficult to ignite a magnesium ribbon.

The ignition of many other combustible mixtures such as the one mentioned above (potassium chlorate-sugar) may be carried out in the same manner.