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Ferrosoferric Oxide Prepared from Iron(III) Oxalate Pentahydrate

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Four supplies of iron(III) oxalate pentahydrate each weighing 56.3550 g (0.121 mol) were heated in an open beaker under an open hood and over a bunsen burner flame producing solids which were black while hot and dark red after cooling. These solids each were found to weigh 21.2979 g (99.324% yield based on iron(III) oxalate pentahydrate) and they were ferromagnetic [1].

Two supplies of iron(III) oxalate pentahydrate each weighing 121.7100 g (0.324 mol) were heated in a flat bottomed flask clamped horizontally and fitted with a one hole rubber stopper through which a glass delivery tube was fitted and connected to a container of distilled water in a vertical postions. Heating was continued until all the water vapor was removed and until black solids were formed. These solids, which remained black after cooling, were found to weigh 45.9900 g (99.309% based on iron-(III) oxalate pentahydrate) and were ferromagnetic [1].

X-ray pictures using copper radiation were taken for the red and the black samples. Each picture was the same and the resulting data compared favorably with the literature [2].

The thermal decomposition of iron(III) oxalate pentahydrate is not completely similar to that for iron(II) oxalate and tin(II) oxalate [3] as evidenced by the yields, the magnet test and the X-ray analysis. Had complete similarity been the case, iron(III) oxide instead of ferrosoferric oxide would have formed in the open beaker and in the closed container. Iron(III) oxide reacts with carbon monoxide to form carbon dioxide and iron but iron in turn reacts with carbon dioxide to form carbon monoxide and ferrosoferric oxide [4] which may have been the case here or it could have been that carbon monoxide reacted with iron(III) oxide to produce ferrosoferric oxide and carbon dioxide, a partial blast furnace reaction [5]. In any case, ferrosoferric oxide was the final product in the thermal decomposition and since the reactant was a pentahydrate, the equation for the reaction was

$$3Fe_2(C_2O_4)_3 \cdot 5H_2O \xrightarrow{\Delta} 5H_2O\uparrow + 2Fe_3O_4 + 10CO_2\uparrow + 8CO\uparrow.$$

A method supplementing preparing ferrosoferric oxide by the reaction between hydrogen and iron(III) oxide [6], the reaction between oxygen and pre-heated iron powder [3], the reaction between super-heated steam and iron filings [7] and the reaction in which a combination of iron(II) chloride and iron(III) chloride is heated in ammonia [8] has been found in attempting to prepare iron(III) oxide from iron(III) oxalate based on the thermal decomposition of iron(II) oxalate and tin(II) oxalate.

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