On the Use of Iridium Crucibles in Chemical Operations.

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I should like to draw the attention of chemists to the great advantages of using crucibles of pure iridium instead of platinum in laboratory work.

Through the kindness of Messrs. Johnson and Matthey I have had an opportunity of experimenting with crucibles of wrought iridium, and have used one for several months in the usual operations of quantitative analysis in my laboratory.

Iridium is as hard as steel, and the crucible is almost unaffected by any mechanical treatment that can reasonably be applied to it.

Brightly polished iridium superficially oxidises with a bluish colour when heated to redness, but it is reduced again on raising the heat. Repeated experiments, however, have shown that no appreciable alteration of weight is thereby caused.

Heated for some hours over a Bunsen burner insufficiently supplied with air the iridium crucible is unaffected and the deposit of carbon easily burns away, leaving the surface of the metal uninjured. All chemists know how seriously a platinum crucible is attacked in these circumstances. Iridium does not blister after long use, and it is unaffected by sulphur in the gas.

The crucible has been boiled in a beaker with aqua regia for several hours, the liquid evaporated down, fresh acids added, and the whole boiled down again. There was no appreciable loss of weight.

Microcosmic salt was fused in the crucible at a good heat for four hours, with frequent additions of carbon; a mixture of magnesium pyrophosphate and carbon has been ignited in it for four hours; and phosphoric acid and carbon have been heated together for some hours in it. In none of these cases was there any loss of weight or apparent action on the metal.

Silica and silicates, with a reducing agent, may be strongly heated in it for some time without forming a silicide or affecting the crucible.

Caustic potash fused at a red heat in the crucible attacks it, but not so strongly as it would have attacked platinum in the same conditions.

The crucible was heated to whiteness and melted lead was poured in. The lead then was boiled away at a white heat. There was no action on the crucible, and after cleaning with acids it appeared unchanged, with no alteration of weight.

Zinc was melted in it at a red heat and partially boiled away. On cleaning

with acids the crucible was unaffected. Zinc and acid zinc chloride (soldering fluid) were then heated in the crucible so that the zinc could "wet" it. The heat was then raised to the volatilising point of zinc for some time. On cleaning with acid the surface of the metal was seen to be superficially attacked, and the crucible had lost a few milligrammes in weight.

Copper melted in the crucible for some time makes it "hot rotten," *i.e.*, it is brittle while hot. But if the copper is well burnt off at a high heat the iridium reverts to its original condition.

Nickel, gold and iron can be melted and kept liquid in the crucible for some time, and then poured off with no injury to the crucible.

I have asked Messrs. Johnson and Matthey to make experimental crucibles of rhodium, ruthenium and osmium. The latter two metals they have not yet succeeded in fashioning, but I have been enabled to try similar experiments to those described above with a rhodium crucible, and I find it practically as resistant in all cases as iridium.

The low density of rhodium (11 as against iridium 22) would be a great advantage in quantitative operations, as the weight of a rhodium crucible would be only half that of one made of iridium, and the cost would be somewhat less.