The black hydrated cobalt oxide, as formed commercially by precipitation from a chloride or sulphate solution with bleach[1], or the brown $Co_3O_4.H_2O$, may be calcined at any temperature between 385° C. and 910° C., to yield substantially the same product, but in practice it is better to calcine at a good red temperature, in order that the calcination may take place with reasonable speed.

That there is a range between 385° C. and 910° C., through which very little oxidation or reduction of the black Co_3O_4 takes place, is shown by the following figures:

Starting with Co_3O_4, heated to constant weight at 385° C., the

loss in weight heating it to constant weight at	640° C.	0·7%
loss " " " " " " " "	770° C.	1·2%
loss " " " " " " " "	860° C.	2·1%
loss " " " " " " " "	910° C.	2·5%

Just above 910° C., however, the reduction begins to take place very rapidly, and the black Co_3O_4 reacts to become grey CoO. Continuing the experiment for which the figures above are given, we have:

Loss in weight heating it to constant weight at 980° C. 7·0%

Co_3O_4 shows no trace of being magnetic.

The Oxide (Co_6O_7)

Co_6O_7 is not to be distinguished from Co_3O_4 either in appearance or in method of preparation; in fact, we have not succeeded in forming a pure oxide of cobalt which analysed very close to 75·9%. On the other hand, as will be noticed in many places throughout this paper, the analyses of the material obtained by calcining at a red heat are frequently something in excess of 73·4% after making allowance for impurities. We, therefore, assume that a certain amount of Co_6O_7 accompanies the Co_3O_4.

Cobalt Monoxide (CoO)

Cobalt monoxide is the stable oxide of cobalt when calcination takes place at a high temperature, that is, in the neighbourhood of 1000° C.

It is a grey powder and may be reduced to the metal by heating with carbon monoxide gas at any temperature above 450° C., or with hydrogen gas at any temperature above 250° C.

Cobalt monoxide also exists in an allotropic form which is a yellow-green powder. Either the yellow-green or the grey cobalt monoxide oxidizes to Co_3O_4, or to a mixture of Co_3O_4 and Co_6O_7 when heated to any temperature between 385° C. and 910° C. The yellow-green variety is readily formed by heating Co_3O_4 with 2 to 3% by weight of C at temperatures in the neighbourhood of 900° C.

Numerous analyses of the purified grey oxide have been made, which range around the theoretical value 78·8%. The following experiment was tried to prove that yellow-green oxide is an allotropic form of the grey CoO.

Black Co_3O_4 calcined at 640° C. to constant weight was then calcined to constant weight at 1020° C. It lost thereby 7·1% in weight, and the product was grey CoO. Yellow-green CoO, produced by the reduction of black Co_3O_4 with hydrogen at 300° C., was calcined to constant weight in air at 640° C., gaining thereby 6·5% in weight and becoming black. This experiment, like the others, indicates that the grey and the yellow-green

[1]See page 3