

lerate the process ; but the operator must blow cautiously, and direct the flame only against the under side of the capsule, in order to avoid the risk of loss. Finally, on the ash ceasing to exhibit in any of its particles a black color, the lid of the capsule is to be carefully replaced, and the whole cooled and weighed.\*

In good coals, the amount of ash is often under 2 per cent., and it rarely exceeds 4 or 5 per cent. In coals of inferior quality, however, it may vary from 8 or 10 to even 20 per cent. As regards its composition, the ash may be :—(1) argillaceous, consisting essentially of a silicate of alumina ; (2) argillo-ferruginous ; (3) calcareous ; and (4) calcareo-ferruginous. If free from iron, it will be white or pale grey ; but if more or less ferruginous, it will present a red, brown, or yellowish color. Phosphor-salt, so useful in general cases for the detection of siliceous compounds, cannot be safely used to distinguish the nature of the ash obtained in blowpipe assays. Owing to their fine state of division and to the small quantity at command, argillaceous ashes dissolve in this reagent with as much facility as those of a calcareous nature, and without producing a characteristic silica skeleton, or causing the opalization of the glass. With calcareous ashes also, the amount obtained is rarely sufficient to saturate even an exceedingly minute bead of phosphor-salt or borax, and hence no opacity is produced by the flaming process. The one kind of ash, may be distinguished, nevertheless, from the other, by moistening it, and placing the moistened mass on reddened litmus-paper. Calcareous ashes always contain a certain amount of caustic lime, and thus restore the blue color of the paper. These calcareous ashes, also, though principally composed of carbonate of lime, sometimes contain small portions of phosphate and sulphate of lime. The presence of the latter may be readily detected by the well known production of an alkaline sulphide by fusion with carbonate of soda in a reducing flame—the fused mass exhibiting a reddish color, and imparting when moistened a dark stain to a plate of silver or piece of lead test-paper. The latter may

\* If the ash be very ferruginous—in which case it will present a red or tawny color—the results, as thus obtained, will require correction : the original iron pyrites of the coal being weighed as sesquioxide of iron. In ordinary assays, however—as distinguished from analyses—this may be fairly neglected. When also the ash happens to be calcareous and to occur in large quantity, it should be moistened with a drop or two of a solution of carbonate of ammoniac, and gently heated, previous to being weighed.