A Note on the Identification of "Insoluble" Sulphates

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Abstract

THE writers, having demonstrated that the mercuric nitrate test for insoluble sulphates — as described by Feigl — is of little use, describe a modified procedure which enables differentiation to be made between the sulphates of Ca, Sr, Ba and Pb.

Feigl (1954, p.369) makes the following remarks :—" A general test for slightly soluble sulphates (i.e., those of Ca, Sr, Ba and Pb) is to treat a little of the material on a watch glass with a drop of an acid solution of mercuric nitrate [10 g. $Hg(NO_3)_2$ plus 1 ml. concentrated HNO_3, in 100 ml. water]. Yellow basic mercuric sulphate is formed. $CaSO_4$ and $PbSO_4$ respond at room temperature ; $SrSO_4$ and $BaSO_4$ must be warmed to develop the yellow. If sulphides and halogen compounds are absent, the test is decisive. The test material must be colourless ; otherwise the yellow cannot be seen."

When the writers repeated this test they found that only $CaSO_4$ developed a yellow tinge at room temperature (c. 60° F.), but, on warming, $PbSO_4$ and $SrSO_4$ both became slightly yellow, whilst $BaSO_4$ remained white.

However, a number of experiments led to the development of the following modified test which has considerably more diagnostic value than that which was claimed (erroneously) for the original :—

1. Add a little mercuric nitrate solution (prepared as for the original test) to the " insoluble " sulphate under examination. Then add double the volume of water and swirl the mixture.

$CaSO_4$ becomes strongly yellow immediately, whilst $SrSO_4$ develops a distinct yellow tinge after one or two minutes : $PbSO_4$ may show a trace of yellow and $BaSO_4$ remains white.

2. Heat the mixture gently for a few seconds over a small flame.

The $CaSO_4$ yellow may intensify somewhat and that of $SrSO_4$, certainly does so: $PbSO_4$ develops a yellow hue whose intensity matches that of $SrSO_4$, whilst $BaSO_4$ remains white, or at the most, assumes a very slight yellowish tinge.

Gypsum (and anhydrite) barite, celestite and anglesite behave in precisely the same way as their laboratory equivalents, although gypsum ($CaSO_4 . 2H_2O$) is somewhat more reactive than the less soluble anhydrite ($CaSO_4$).

It is, therefore, an easy matter to differentiate between the "insoluble" sulphates by employing this test alone.

A number of excellent confirmatory tests for these sulphates is described by Feigl (1954, pp.369-370) and also two which enable differentiation to be made between gypsum and anhydrite (pp.414 and 447). The writers, often employ, in addition, the potassium iodide test — which is not mentioned by Feigl — to confirm Pb in $PbSO_4$. This simply involves adding a small crystal of KI and a few drops of 5N. acetic acid to the substance under test. The presence of lead is indicated by the immediate appearance of an intensely yellow precipitate of PbI_2.

REFERENCES

FEIGL, F. Spot tests, vol. 1 (London : Elsevier Publishing Co., Ltd., 1954).

Analysis

Analysis of the creature known as Woman — as seen through the eyes of a chemist.

Symbol :	WOE.
Atomic Weight :	120 lbs.
Occurrence :	Found wherever man exists.

Physical Properties :

1. Boils at nothing, and freezes at any moment.
2. Melts when properly treated ; very bitter when not well used.

Chemical Properties :

1. Possesses a great affinity for Gold, Silver, Platinum and Precious Stones.
2. Violent reaction if left alone.
3. Liberates secrets when dipped in conversation.
4. Turns green when placed beside a better specimen.
5. Highly explosive.
6. Highly ornamental.

Uses :

As a tonic for low spirits.
Great equaliser of the distribution of wealth.
Probably the most effective Income Reducing Agent ever known.

K.H.