On the Colour of the Anhydrite.

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The occurrence of the anhydrite in Japan is very rare. It has been found only in the Hanaoka^(1, 2) and Kanô mines, where the anhydrite occurs in the gypsum mass associated with the Kuromono deposits and is characterized by the pale bluish colour.

The colour of the mineral in general, is divided into two kinds; one is the proper colour of the mineral or idiochromatic one, and the other is the colour due to impurities, i.e. allochromatic colour.⁽³⁾ The pure anhydrite is a colourless mineral. The pale bluish colour of the anhydrite from the Hanaoka and Kanô mines must be due to some impurities or pigments. Concerning this point, the existence of strontium⁽⁴⁾ in the barite and witherite crystals of the Hassei mine (formally called the Tsubaki mine), province Ugo, is a noteworthy fact, and it is supposed that the pale bluish colour of the anhydrite from the Hanaoka and Kanô mines is also due to the mixture of celestine or strontium sulphate in it.

The chemical analyses of the anhydrite were made by the writer to ascertain the existence of strontium in it, and the following results were obtained:—

	CaO	SO ₃	Zn	CO ₂	Al ₂ O ₃	Sr	FeS ₂	Cu
I	41.84	58.26	none	0.14	0.97	none	0.11	none
II	41.46	57.96	none	0.17	0.05	none	0.02	none
III	41.08	58.92						

(1) K. Kinoshita, Anhydrite from the Hanaoka mine, Sci. Rep. Tohoku Imp. Univ. III, Vol. I, No. 3, 1923.

(2) K. Sugawara, On the occurrence of the anhydrite in the Hanaoka mine, Ugo Province, MS. Graduating thesis, Tohoku Imp. Univ.

(3) C. Doelter, Die Farben der Mineralien, 1915.

(4) K. Jimbô, Strontium in Japan, Jour. Geol. Soc. Tokyo, Vol. XXV, 1918 (Japanese).

- I Anhydrite from the Hanaoka mine.
- II that from the Kanô mine.
- III Theoretical chemical composition of the pure anhydrite.

As is seen in the above table, the anhydrite crystals from the Hanaoka and Kanô mines are nearly pure calcium sulphate and do not contain any of strontium, zinc carbonate, copper carbonate, copper sulphide, iron sulphate, copper sulphate, etc., which usually associate with the Kuromono deposits, and show blue or greenish colour. Hence the pale bluish colour of the anhydrite is not due to these impurities but must be of another origin.

However, some allochromatic colour is not due to the mixture of other impurities; for example, colourless rock salt (sodium chloride) shows pale bluish colour on account of the existence of the colloidal sodium chloride, and colourless silica changes into milky opalescent mineral in gel state.⁽¹⁾ Hence it can be supposed that the pale bluish colour of anhydrite now under consideration may be also due to such origin.

There are two modes of occurrence of anhydrite in the Hanaoka and Kanô mines. One of them is the massive anhydrite disseminated by abundant pyrite, and the other is in vein form consisting of parallel or radial aggregate of long acicular anhydrite. In the Hanaoka mine, only the massive anhydrite shows pale bluish colour, while in the Kanô mine some vein-forming anhydrite also shows the same colour.

The microscopical structure of the anhydrite mass much resembles that of alabaster, but the former is coarser grained than gypsum. Commonly it is composed of an aggregate of stout prismatic crystals which do not show a perfect crystal outline, owing to the mutual interference of adjacent crystals, but is partly composed of a cryptocrystalline aggregate of anhydrite.

The vein-formed anhydrite is coarser grained than the massive

(1) Jones, Nature of solution. 1917.

anhydrite, commonly prismatic and arranged nearly parallel to each other, or with radiating texture. Each crystal is idiomorphic and cleavages crossing nearly perpendicular to each other are well developed. In the pale bluish anhydrite, cryptocrystalline aggregates are found between the prismatic crystals or rectangular cleavages.

When the anhydrite is exposed to the sun light, it loses gradually its pale bluish colour, and changes into white translucent one. From this nature and characters under the microscope the writer considers that the existence of colloidal calcium sulphate in anhydrite causes its pale bluish colour.

To ascertain this, the writer tried to prepare the colloidal calcium sulphate by reaction between calcium acetate and sulphuric acid.

The crystals of calcium acetate were dissolved in water, and a molar solution was obtained. It was then diluted with six times its volume of alcohol. To the solution, a quantity of an alcoholic solution of sulphuric acid (obtained by diluting a molar aqueous solution of the acid with twice its volume of alcohol) equivalent to the acetate was introduced under constant stirring. The milky solution and precipitate thus obtained were together evaporated to dryness on the thermostat keeping the temperature at 35° C. In this way was obtained a translucent colloidal calcium sulphate with pale bluish colour.

From the above-mentioned experiment and mineralogical character of anhydrite, it is highly probable that the pale bluish colour of anhydrite is due to the presence of colloidal calcium sulphate, and absorption or partial distortion of light by gel particles, owing to extremely small size of grain is the chief cause of the pale bluish colour.