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ADDITIONAL DATA CONCERNING THE PRESERVATION OF MINERALS*

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Some years ago the writer prepared a paper on "The Preservation of Mineral Specimens,"¹ in which he indicated several ways by which minerals are susceptible to change when exhibited or stored in museums and gave a list of minerals that are peculiarly liable to damage.

In the interval, since the publication of the original article, several other interesting cases of change in minerals have been brought to the attention of the writer by discussion in THE AMERICAN MINERALOGIST, by personal communications and by observation and experiment. In certain instances an explanation of the extreme scarcity of rare minerals is presented. A few cases of preservation by association and possibly destruction because of associated minerals have also come to light.

The problems that present themselves most forcefully in the case of minerals are light effects, temperature effects, and chemical effects. Needless to say there is no museum that is equipped so as to display all its material without damage.

Two cases of oxidation of native metals have come to light. The late E. O. Hovey called to the writer's attention the fact that certain specimens of the native iron from Greenland oxidized to a crumbly mass when stored indoors, while a specimen which was kept outside his window on the window sill showed no signs of crumbling. In a similar manner it has been found at the Royal Ontario Museum of Mineralogy that the native lead from Sweden becomes covered with a gray pulverulent coating, evidently resulting from the oxidation of the lead or of some associated mineral. In neither case is there a satisfactory explanation of the peculiar behavior of these substances but it is evident that definite precautions must be taken. Possibly a lowering of the temperature would prove sufficient in both cases.

* Presented at the sixth annual meeting of The Mineralogical Society of America, New Haven, Conn., Dec. 28, 1925.

¹ *Am. Mineral.* 7, 59-63, (1922).

The conditions for the oxidation of sulphides and arsenides are difficult to determine but peculiar differences with the same mineral are frequently noticed. Gersdorffite crystals embedded in calcite from the Crean Hill mine near Sudbury have remained brilliant and untarnished for years. The same mineral, however, from the Silver Bar mine in Cobalt in association with smaltite, niccolite, cobaltite and rammelsbergite tarnishes in a few weeks on the polished specimens to a brown, and no means is known for preventing this change. Both types have been analyzed and the only factor that can be inferred to account for the rapid change in the material from Cobalt is that the particular association of minerals hastens the change. Conversely, specimens of pure polydymite from the Vermilion mine near Sudbury oxidize rapidly and disintegrate under ordinary museum conditions while the same mineral when associated with chalcopyrite remains bright for years. The pure material disintegrates much more slowly when kept absolutely dry and warm. In this case the chalcopyrite appears to exert a protective influence.

Brilliant marcasite crystals have frequently been found by the writer on old mine dumps in association with calcite, barite and fluorite while specimens from certain lead and zinc mines gradually disintegrate in the mineral cases. The extremely rapid oxidation of marcasite in coal is difficult to explain but is a well known fact.

Recently the writer, in collaboration with his colleague Professor T. L. Walker, has made some experiments with the oxidation of certain arsenides and sulphides in an atmosphere saturated with moisture as well as in pure oxygen and other gases with water.² Bright rammelsbergite became covered with green nickel bloom in less than a week at room temperatures. Niccolite that was associated with the rammelsbergite became coated more slowly but an intimate mixture of niccolite and breithauptite remained perfectly brilliant. In its relation to the preservation of these materials it emphasizes the necessity of storing them in a dry place. Apparently breithauptite is not only extremely resistant to weathering but protects niccolite from oxidation.

The lighting problem in most cases does not present serious difficulties though in addition to the minerals mentioned in the previous article Walther³ has called attention to the alteration

² *Univ. of Toronto Studies, Geol. Ser.*, 20, 41-48.

³ *Am. Mineral.*, 7, 145, (1922).

of cinnabar, chrysoprase, and green fluorite from exposure to light. A remarkable instance of change of color by exposure to light is furnished by the hackmanite from Dungannon township, Ontario⁴ and other places, which becomes white in from ten to twenty seconds when exposed to direct sunlight.

Another example of complete bleaching is afforded by the topaz from Thomas Mountain, Utah, which is usually observed as colorless transparent crystals. Crystals which have been protected from light are various shades of claret.

A mineral that is said to become much darker on exposure to light is azurite. Tyuyamunite changes from lemon yellow to dirty greenish yellow in a few minutes in direct sunlight. Hisingerite from the Minnie Moore mine, Blaine county, Idaho, is claret red when fresh but rapidly turns black and then slowly to dark brown.⁵

Dr. L. J. Spencer has called the attention of the writer to the fact that colorless vivianite when broken open turns blue in a short time. In this case it would appear that the conditions of equilibrium are destroyed by the rupture of the crystal surface.

Rapid temperature changes seldom manifest their effects under museum conditions so as to be visible. The only case that the writer has observed that is probably to be referred to this cause is the development of two well defined cleavage cracks in a water clear crystal of fluorite in one of the exhibition cases of the Royal Ontario Museum of Mineralogy.

A feature that must be taken into consideration immediately after collecting certain minerals is the possibility of intermolecular liquid which on evaporation leaves crystals of a material that had been dissolved with a consequent shattering of the crystals of the host mineral. This was called to the attention of the writer by F. N. Ashcroft, Esq., who observed that certain analcite crystals from below high tide level, which had not been soaked in fresh water to remove brine, became shattered while those that had been immersed for some time in fresh water remained clear and free from shattering.

To the minerals that melt at low temperatures we must add asphaltum and ozocerite.

Loss of water at ordinary temperatures was discussed at length in the preceding article. A striking case of this sort has developed

⁴ *Univ. of Toronto Studies, Geol. Ser.*, 20, 5.

⁵ Hewett and Schaller: *Am. J. Sci., Ser. V*, 10, 33.

in the meantime with epsomite. Some large lumps of this mineral from Basque Siding, Ashcroft, B. C., have been on exhibition for several years in a large glass container. The material is as bright as when first collected. A large reserve specimen wrapped in paper has become chalky and friable.

In discussion, Dr. A. C. Lane called attention to the fact that minasragite which had been stored in a possibly damp basement during the summer was represented by a green spot in the tray.

Dr. G. F. Kunz pointed out that silver and lead, as well as almost any mineral, would be better preserved by dipping them in a solution of alcohol (95%) and collodion (5%). The collodion can be removed again by alcohol if it is desirable to use the material for investigation.

Mr. G. L. English stated that specimens of native lead from Sweden at Ward's Natural Science Establishment had remained bright and unaltered.

DOUBTFUL MINERAL SPECIES AS ILLUSTRATED BY "FAROELITE"*

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"Faroelite" is a mineral name of so little importance that any printed discussion of it may seem unwarranted, but it is believed that some parts of such a discussion may be made of so general a character as to warrant its presentation.

That the great majority of common silicate minerals vary considerably in composition is now so well established and generally recognized that the obvious application of this fact to concrete cases may fairly be expected; yet articles still appear which seem to ignore it completely. Before the development of our knowledge of isomorphous variations in mineral systems this was more or less excusable; but at the present day it is surely not going too far to hold that *two samples of silicate minerals, which are closely similar (but not identical) chemically and also crystallographically, probably belong to an isomorphous series or system, and names implying the existence of two different independent species should not be used for such cases unless accompanied by unquestionable evidence that the substances are not isomorphous.*

* Presented at the sixth annual meeting of The Mineralogical Society of America, New Haven, Conn., Dec. 28, 1925.