

accept this as a working hypothesis, the strong point in the theory of unmixing, viz:—the idea of an initial melt, is lacking. This presents a real difficulty for which no satisfactory explanation seems available.

FURTHER NOTE ON SARCOPSIDE

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In 1920 the writer described sarcopside from Deering, N. H., the second known locality for that mineral.¹ Since then further details regarding sarcopside and its associated minerals have been noted, and they are given in this supplementary paper.

Websky,² in describing the original sarcopside from Michelsdorf in Silesia, did not give its optical properties. Mr. W. A. Roebling very kindly lent the writer a specimen of Silesian sarcopside for comparison with the Deering mineral. The two are identical in optical properties, that from Michelsdorf having n approximately 1.72, agreeing very closely with the value previously given for the New Hampshire specimens, 1.725. Under the microscope, however, Websky's mineral was found to contain bluish and greenish altered areas scattered through the colorless sarcopside, while the American specimens are much purer. This is also indicated by the analyses as given in the writer's previous paper. The iron of the New Hampshire sarcopside is nearly all in the ferrous state (39.87% FeO, 1.70% Fe₂O₃) while Websky's analysis shows a larger proportion of ferric iron (30.53% FeO, 8.83% Fe₂O₃), which is undoubtedly due to alteration. A further difference is that the sarcopside from Michelsdorf occurred in small confused aggregates not exceeding an inch in diameter, while, as noted below, the mineral from the newer locality has been found in pieces as large as a foot in length, with a straight fibrous structure.

Since the New Hampshire occurrence was first described more blasting has been done by the Gingrass brothers, who own the prospect. This has uncovered several large pieces of sarcopside, one of which was about three decimeters long and one decimeter in diameter. Unfortunately most of these newer specimens have

¹ Edw. F. Holden. An American Occurrence of Sarcopside. *Am. Min.*, 5, 99-102, (1920).

² M. Websky. *Z. Deutsche Geol. Ges.*, 20, 245, (1868); abstracted in *Jahrb. Mineral.* 606, (1868).

suffered alteration along cleavage cracks. They must have lain near the surface of the rock in the excavation for about ten years, the period which elapsed before blasting was resumed. But it was possible to break out many good specimens from these pieces. Previous to this only two small fragments, $3 \times 3 \times 2$ and $2 \times 2 \times 1$ cm. had been found.

Several interesting iron phosphates were associated with the more recently discovered sarcopside. Two of these were alteration products of that mineral. The alteration is largely a process of oxidation of the ferrous iron of pure sarcopside. The first change is to bluish and greenish spots which contribute the ferric iron shown by the analyses. The next product is a granular dark blue mineral, a ferro-ferric hydrated phosphate resembling "blue vivianite". The final stage of alteration is to an amorphous yellowish brown mineral encrusting the sarcopside. It is a hydrated ferric phosphate, containing some ferrous iron, but not as much as is in the blue mineral, judging from qualitative tests. This substance has $n = 1.67 - 1.68$. It is evidently related to the poorly defined amorphous ferric phosphates such as koninckite ($n = 1.65$)³, picite and delvauxite.

In the pegmatite near the sarcopside were radiating fibrous layers of dufrenite of brown to greenish black color. It was identified by qualitative chemical tests, and by some of its optical characters. Tests were obtained for both ferrous and ferric iron, a trace of manganese, water, and phosphoric acid. The value for n was greater than 1.74; the elongation of the fibers was negative. Pleochroism was somewhat variable, generally it was: X, yellow to yellowish brown; Y, light to dark olive green; Z (normal to the cleavage), undetermined. Some fragments showed: X, yellow to brownish yellow; Y, greenish brown to dark brown. Extinction was parallel to the fibers. These characters agree with those of Larsen's type A dufrenite, with small 2V.⁴

In thin layers between the bands of dufrenite, and scattered through the rock near the dufrenite, was a finely fibrous, yellow mineral having the following properties: composition, hydrated ferric phosphate, some ferrous iron present; elongation +; pleochroism, dark yellow parallel to the fibres, light yellow across the fibers; extinction parallel; indices of refraction 1.700 and 1.720

³ E. S. Larsen. The Microscopic Determination of Non-opaque Minerals. *U. S. Geol. Surv. Bull.* **679**, 176, (1921).

⁴ Larsen, *ibid.* 69.

(+.005). This agrees with cacoxenite except that the indices are much too high, compared with those given by Larsen⁵, 1.58 and 1.64. But cacoxenite is variable in both composition and optical properties, according to Doelter.⁶ Larsen states that some of the fibers on a specimen from Saxony, especially near the ends, have considerably higher indices of refraction. A variation in water content might easily cause marked differences in indices. Cacoxenite has been recorded as occurring with dufrenite. Evidently this mineral, which occurs in too small quantities for chemical analysis, is either related to or identical with cacoxenite.

It can hardly be doubted but that a closer examination of many New England pegmatites would reveal the presence of more of these unusual phosphates.

A. CONVENIENT METHOD FOR CHECKING THE INDEX OF A LIQUID

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Liquids for determining the indices of minerals are used very extensively in petrographic investigation, especially in the study of crushed minerals and cleavage fragments. For such purposes it is essential to have liquids whose indices are known or can be easily determined. The greater number of the easily obtainable liquids for such purposes suffer changes in index through volatilization and must, of necessity, be checked before using when accurate results are desired. The check can be made by refractometers but in many smaller laboratories these are not readily available.

Powdered glass has been used by the writer for some time as a substitute for the refractometer. The glasses of known index can be obtained for a reasonable price from lens and optical glass manufacturers. A convenient form for usage is the powder which can be kept in small bottles with the index marked on the container similar to "index liquid" bottles. A still more convenient container is one with a sieve-cap of fine mesh, resembling a salt or pepper shaker, from which a small amount of the powder can be easily removed for use.

The writer has found it most satisfactory to screen the powdered glass into three sizes, namely: 100-150, 150-200, and 200-250.¹

⁵ Larsen, *ibid.* 51.

⁶ C. Doelter. *Handbuch der Mineralchemie*, 3, pt. 4, 534, (1914).

¹ Standard screen mesh.