($FeSO_4 \cdot 7H_2O$), one of the more widespread and more abundant sulphates." Schaller (1940) also refers to siderotil as associated with a phosphate-sulfate of aluminum from Utah. Kubisz (1960) described a new mineral, rozenite, $FeSO \cdot 4H_2O$, from "Staszie." Siderotil is a well-established mineral name and so has precedence.

References

A.S.T.M., (1960), Index of Powder Diffraction Patterns. Card No. **0422.**

Fleischer, M., (1961), New Mineral Names, Rozenite. *Am. Mineral.*, **46,** 242–243.

Kossenberg, M. and A. C. Cook, (1961), Weathering of sulphide minerals in coal: production of ferrous sulphate heptahydrate. *Mineral. Mag.*, **32,** 829–830.

Kubisz, J., (1960), Rozenite—$FeSO_4 \cdot 4H_2O$—a new mineral. *Bull. Acad. Polonaise., Sci.*, **VIII** (2), 107–113.

Larsen, E. S., (1921), The microscopic determination of non-opaque minerals, *U. S. Geol. Surv. Bull.*, **679.**

Midgley, H. G., (1958), The staining of concrete by pyrite. *Mag. Concrete Res.*, **10,** 75–78.

Palache, C., H. Berman, and C. Frondel, (1951), Dana's System of Mineralogy, Vol. II, John Wiley and Sons, N. Y., p. 491.

Ross, C. P., (1940), Quicksilver deposits of the Mount Diablo district, Contra Costa County, California. *U. S. Geol. Surv. Bull.*, **922B,** 31–54.

Schaller, W. T., (1940), A probably new phosphate-sulphate of aluminum from Utah. *Am. Mineral.*, **25,** 213–214.

Schrauf, A., (1891), *Jahrb. k.k. geol. Reichsanst,* **XLI,** 380.

Spencer, L. J., (1897), A list of New Mineral Names. *Min. Mag.*, **11,** 335.

Wyckoff, R. W. C., (1960), Crystal Structure, Vol. **III.** ch. X.

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REEXAMINATION OF CUPRORIVAITE

Fiorenzo Mazzi and A. Pabst, *Universitá di Pavia, Italy and University of California, Berkeley, California.*

Cuprorivaite was described as a new mineral from Vesuvius by Minguzzi (1938). He assigned it the formula, $2(Ca, Na)(Cu, Al)(Si, Al)_4(O, OH)_{10} \cdot H_2O$, derived from analyses of impure material after deductions for contamination. Some critics have questioned the validity of the species, and Strunz (1957, p. 366) says cuprorivaite is a mixture of wollastonite and glass. One of us (Pabst, 1959) suggested that cuprorivaite is probably the natural analogue of Egyptian blue, $CaCuSi_4O_{10}$. Our reexamination was carried out on crushed material remaining from the type specimen used by Minguzzi. No other cuprorivaite was available for study.

By means of heavy liquids, tetrabromethane diluted with toluene, followed by manual separation, one of us (F. M.) obtained about 1 cg of pure crushed cuprorivaite. This was used to get a powder diffraction record on an *x*-ray diffractometer in the University of Florence kindly made available by Professor G. Carobbi. A technique appropriate for very small samples was employed. The specimen holder is filled with NaF and this is overspread with a thin layer of the material to be examined, the NaF peaks on the diffractogram serving as an internal standard (Garavelli and Mazzi, 1957).

The cuprorivaite sample treated in this manner yielded a diffractogram corresponding closely to the published photographic powder pattern of $CaCuSi_4O_{10}$ (Pabst, 1959, Table 2). Differences in intensity recorded may be attributed to differences in the degree of orientation in the preparations and in the manner of recording.

In the meantime about one gram of the crushed impure sample containing cuprorivaite had become available to one of us (A. P.) through the kindness of Dr. Emilia Marselli of Naples. From this several single crystals about 0.1×0.1×0.03 mm were selected. Two crystals were used to obtain *hk*0, *hk*1, *hk*2 *h*0*l* and *hhl* precession patterns with Mo radiation. These matched exactly the corresponding patterns previously obtained from artificial $CaCuSi_4O_{10}$, not only in lattice dimensions but also in the intensities.

Crystals of cuprorivaite are basal plates, usually broken and with attached fragments of other crystals or of quartz. One crystal was found on which it was possible to identify $\{102\}$ in addition to $\{001\}$. This corresponds to the morphology of the artificial crystals which invariably show $\{001\}$, $\{102\}$ and $\{110\}$. The indices of refraction were determined on another crystal mounted on a goniometer head by immersion in liquids in a special cell attached to a microscope with axis placed horizontally as described by Fisher (1960).

The density was measured by immersion of clean crystals in mixtures of methylene iodide and α-chloronaphthalene in a small cell, observing their motion under a binocular microscope, determining the indices of refraction and temperature of the liquid mixture when the crystals remained in suspension and referring to the curves published by Bloss (1961, p. 64) which relate density to temperature and index of these liquids.

Through the courtesy of Mr. Monte C. Nichols of the Department of Chemistry of the University of Arizona one of us (A. P.) was enabled to examine material from the bricks of a copper smelting furnace at Ajo, Arizona. A small blue crystal fragment from this material was examined by the precession method and found to be identical with Egyptian blue or cuprorivaite. A similar occurrence has been described by Ivanov *et al.* (1938).

The properties of cuprorivaite may be summarized as follows: $CaCuSi_4O_{10}$, *a* 7.30±0.01, *c* 15.12±0.02 Å, Z=4, *P*4/*ncc*: *x*-ray powder diffraction pattern same as for artifical $CaCuSi_4O_{10}$. Cleavage {001}, perfect; brittle; hardness not surely determined, probably near 5; density 3.08±0.6 (obs.), 3.09 (calc.). Color blue; vitreous. ω 1.633 ±0.003, ϵ 1.590±0.003 (artificial 1.636 and 1.591±0.003 respectively, Minguzzi had considered cuprorivaite biaxial negative, 2V 13° 14′, indices 1.589, 1.627 and 1.6275). Pleochroism, O blue, E pale rose, nearly colorless. Habit tabular {001}, rarely also {102} and possibly {110}. Insoluble in HCl.

REFERENCES

Bloss, F. Donald, (1961), An Introduction to the Methods of Optical Crystallography. Holt, Rinehart and Winston, New York.

Fisher, D. Jerome, (1960), A new universal-type microscope. *Zeits. Krist.*, **113**, 77–93.

Garavelli, C. L. and F. Mazzi, (1957), Un metodo per l'esecuzione di diffrattogrammi a raggi X su campioni dell'ordine del centigrammo. *Atti. Fondazione G. Ronchi*, **12**, 3–13.

Ivanov, B. V., A. I. Zvetkov, and I. M. Shumilo, (1938), On Egyptian blue and refractories for copper smelting furnaces: *Comptes Rendus Dokl. Acad. Sci. URSS*, **20**, 685–687 (in English).

Minguzzi, Carlo, (1938), Cuprorivaite: un nuovo minerale: *Period. Mineral.*, **8**, 333–345.

Pabst, A., (1959), Structures of some tetragonal sheet silicates. *Acta Cryst.*, **12**, 733–739.

Strunz, Hugo, (1957), Mineralogische Tabellen. Akad. Verlags. Leipzig.

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A COMPUTER PROGRAM FOR HANDLING CHEMICAL ANALYSES OF AMPHIBOLES AND OTHER MINERALS

Horace Winchell, *Department of Geology, Yale University, New Haven, Conn.*

A program for recasting chemical analyses has been written for the IBM 650 computer; the input is a conventional chemical analysis in weights per cent of 13 common oxide components (including F and Cl); output is ready to use in regression routines written for the 650 by G. M. Furnival, and it is also useful for manual inspection and for other purposes.

The program first recasts the chemical analysis into the form of atoms per 24000 (O+F+Cl) and reports the result; these atoms are then assigned successively to appropriate positions in the amphibole formula $A_wB_2C_5D_8O_{22}E_2$, starting with the tetrahedrally coordinated spaces D and with the smallest cations Si, then Al, then Fe^{3+}, then Ti, or as far