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, $P4/ncc$: 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.

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

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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

through this list as is necessary to fill up the available spaces D. The remainder of the Al, etc., are then assigned to C, and this space is filled up by additions, in order, of Mg, Fe^{2+}, Mn, Ca. Remainders of these and the Na and K are assigned to position B until that is full, then any remaining Ca, Na, and K are assigned to position A. The F and Cl are assigned to position E, and the remaining space therein is filled by O+OH, or by OH+H_2O. A warning card is punched if there is too much H for that. Warning cards also are punched during the program if the summation reported in the input differs from the sum of the oxides reported, if there are insufficient numbers of atoms of (Si, Al, Fe^{3+}, Ti) for position D, and if there are insufficient atoms for position C. The sum of all atoms except H, F, Cl, and O, and the sum of 3000+cations in B and A, are reported; the latter sum may be compared directly with the last four digits of the former to check on the sufficiency, and on possible excess, of atoms for any of the positions.

Thirteen variables w_i, representing the numbers of atoms per 24000 (O+F+Cl), and a fourteenth w representing the sum of the first ten of these, are reported out. Twenty-five variables x_i represent the assignments of these 13 to various positions in the amphibole formula. Both sets w_i and x_i are in form suitable for use in the Furnival regression program.

Up to thirteen variables y_i, representing optical properties, specific gravity, and various lattice constants and functions thereof, may be included in the input, and after slight rearrangement these same numbers are reproduced in the output, together with two code digits representing certain combinations of (a) n_x, n_y, n_z, $Z\wedge c$, and G, and (b) a, b, c, β, and functions depending on them. These code digits permit sorting the cards so that groups having the same assortments of variables can be prepared for the regression analysis. The variables y_i are mostly in the form of 4-digit and 5-digit numbers appropriate to the best accuracy that is commonly available in these physical measurements.

Because the output includes the set of data w_i, the program can be useful for other minerals than hornblende, with or without a simple change that would cancel the remainder of the program after reporting w_i.

Two alternate programs are automatically introduced if the amount of Si per 24000 (O+F+Cl) is greater than 8000. The first of these reduces Si to 8000 by assuming that some free quartz impurity was present in the analyzed sample; the second assumes that some H_2O was missed in the analysis. Both alternative programs yield full sets of data-reports, but only w_i-data are reported from the main program, if the alternate programs are run.

Several other alternate programs could be incorporated if needed, as for example, ones to handle excess H, or excesses or shortages of any other

elements as signalized by a difference between the sum of the first 10 w's, and the sum of 13000+A+B. Shortages signalized by warning-cards can be made up by various assumptions, such as assumed errors in the H_2O-determination; excesses can be corrected in the same way, or by carrying over some atoms to a position of larger than normal size (as Mn, Fe^{2+} with the normal Ca, Na, K in position A). In a set of some hundreds of published amphibole analyses, I have used about six alternative programs, performed manually because the number of instances did not seem sufficient to warrant writing them for automatic operation by the 650. The alternative programs are easy to compute by slide rule from the w_i-data resulting from the preliminary recast of the analyses.

This note is published on the assumption that there may be mineralogists interested in further correspondence and/or discussion of the topics noted,—either programming problems, or regression studies.