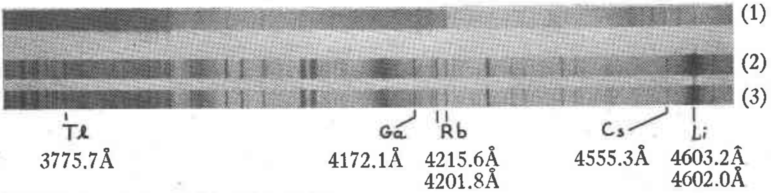
separated from each other by crystallizing as rubidium bitartrate and cesium antimony chloride, respectively, from which rubidium chloride and cesium chloride were prepared. The spectrographic examination and chemical procedure are described by us more fully elsewhere.[6]



(1) Spectrum of graphite electrodes.
(2, 3) Spectrum of Lepidolite. FIG. 1

The quantities of rubidium chloride and cesium chloride obtained correspond to 0.67% Rb_2O and 0.16% Cs_2O in the raw lepidolite. The actual cesium and rubidium content of the lepidolite was presumably slightly higher, since traces of these elements were lost in the process of extraction and purification. The gallium and thallium were present in traces only, the amount being estimated from the intensities of their spectral lines.

The occurrence of the rubidium, cesium, gallium and thallium in the lepidolite may be explained on the basis of isomorphous replacement, in which the rubidium, cesium and thallium replace part of the potassium, and the gallium replaces part of the aluminum. Similar replacement of potassium by rubidium and thallium, and of aluminum by gallium, has been described for various minerals, other than lepidolite, from the Katzenbuckel Mts. in Odenwald.[7]

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[6] Article submitted to *Ind. Eng. Chem.*

[7] F. Schröder, *Neues Jahrb. Mineral., Geol.*, Abt. A, **63**, 215, 1931.

THE CRYSTAL STRUCTURE OF POTASSIUM DITHIONATE, $K_2S_2O_6$

MAURICE L. HUGGINS, (*Johnston Scholar in Chemistry*), *Johns Hopkins University.*

Because of criticisms[1,2] of some of the results reported in a paper having the above title by Huggins and Frank[3] the writer has re-

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[1] Hägg, *Zeit. Krist.*, (A) **83**, 265, 1932.

[2] Helwig, *Zeit. Krist.*, (A), **83**, 485, 1932.

[3] Huggins and Frank, *Am. Mineral.*, **16**, 580, 1931.

cently carefully gone over the work reported in that paper. Nothing seems to be wrong with the structure analysis as originally carried out but two serious errors were made in the final preparation of the paper. The writer greatly regrets these errors and takes the full blame for them.

In the first place, the potassium atom parameters given in Table 4 were not those deduced from the data and used in the calculation of structure factors and interatomic distances. They should have been given as $u_k = 0.375$ and $u_k' = 0.690$. Also the oxygen atoms in one of the $S_2O_6^{--}$ groups were incorrectly placed in Figure 6. The positions shown agree neither with the symmetry of the space group nor with the atomic coordinates listed in Table 4. A correctly drawn figure is now given.

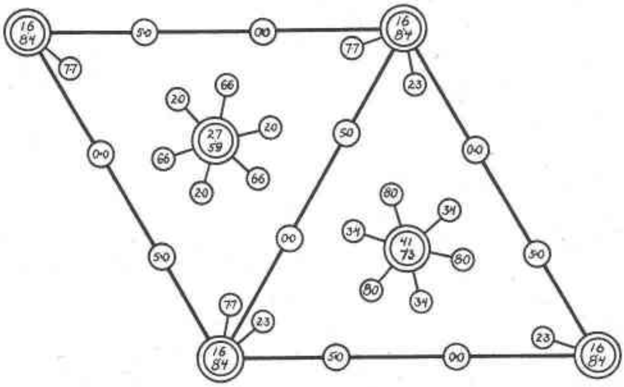

FIG. 1. (Replacing Fig. 6 in the paper by Huggins and Frank.) The distribution of atomic centers in the unit cell of $K_2S_2O_6$. Small circles represent oxygen, large circles potassium and large double circles pairs of sulfur atoms. The figures are the *z* coordinates, in hundredths of the unit distance.

Helwig's criticism that "certain planes which from symmetry considerations should give equal intensities of reflection are represented in the tables by *F* values which differ considerably" is easily explained. These *F* values were calculated (as stated in our paper) without making any correction for the differences in absorption and in the number of cooperating planes due to differences in length of path through the crystal for different reflections. Although these corrections could not be quantitatively made they should vary regularly along each of the rows (vertical, horizontal or diagonal) in Table 5, in which the positions of the indices correspond roughly to the relative positions of the reflections on the photograph and of the points of the reciprocal lattice projection made from it. The omitted corrections would be very different for reflections of rays having very different path lengths through the crystal, as in the cases of the pairs of reflections mentioned by Helwig.

Helwig's F_{obs} values are in good agreement with ours but include more reflections. Calculations of F values for all of the reflections listed by him (a) as made by him, using atomic F curves of unknown origin, (b) as made by me, using his parameter values and the atomic F curves given in Ref. 3, and (c) as made by me, using the Huggins and Frank parameter values, show practically the same measure of agreement with the F_{obs} values. The last however seems to be slightly the best.

Although Helwig implies that he used the concept of interatomic distances to deduce his parameter values, the latter lead to improbably small values (2.20 Å for one kind of potassium, 2.31 Å for the other) for the distances between each potassium center and the centers of two of its six oxygen neighbors. K–O distances in other crystals (See Ref. 3, p. 590) are always much larger. For this reason the writer believes that Helwig's values for the parameters cannot be correct.

The results of these structure factor and interatomic distance calculations are given in more detail in a paper being sent to the *Zeitschrift für Kristallographie.*

DIRECTORY OF AMERICAN AND CANADIAN MINERAL COLLECTIONS

Samuel G. Gordon, *Academy of Natural Sciences of Philadelphia.*

(*Continued from page 418.*)

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