ment, of which an unlimited number of examples can be constructed, in which the absences will be indeed systematic but without the corresponding symmetry. Consider the atoms divided into two or more sets. The members of the first set have positions related, for example, by a set of glide planes. The members of the second set have positions related by a set of glide planes parallel with but not coincident with the first set. Similar statements apply to the other atomic sets, if any. None of these 'glide planes' is a property of the total assembly, because none operates properly on all the atoms. The structure factor of the crystal is, however, zero for reflections corresponding to absences for such a glide plane, and thus the intensity data would suggest the presence of the glide plane. This follows from the fact that for appropriate *hkl* each set has zero structure factor, and the total structure factor is a vector sum of the set structure factors. For the absences to be perfect, of course, the electron density of each set must correspond to the 'glide planes', as it will if the atoms are spherical.

Similar examples can be constructed in obvious ways for screw axes, for combinations of screw axes and glide planes, or for combinations of non-primitive translations with screw axes and glide planes. Any extinction rule common to the 'symmetries' of the sets will be obeyed by the total assembly.

Consider four pairs of atoms in space group $P2_1$ in positions x, y, z; $\bar{x}, \frac{1}{2}+y, \bar{z}$ with x, y, z, respectively:

$$\begin{aligned} &m, n, p\\ &m, t-n, \tfrac{1}{2}+p\\ &q, r, s\\ &q, u-r, \tfrac{1}{2}+s\,. \end{aligned}$$

The first two pairs considered alone have symmetry $P2_1/c$ with a center of symmetry at $(0, \frac{1}{4}+\frac{1}{2}t, \frac{1}{4})$. Similarly the last two pairs have a center at $(0, \frac{1}{4}+\frac{1}{2}u, \frac{1}{4})$. But, if t and u are unequal (mod 1), the complete assembly has no center of symmetry though the absences correspond to $P2_1/c$.

This kind of arrangement is rare or perhaps even nonexistent in Nature. But it is not unreasonable that it could occur in substitution or defect structures with large unit cells which are based on simple substructures. Such statements as 'The systematic absences prove that the space group is $P2_1/c$', of which I have been guilty as have others, are to be deplored. It does not seem to be unreasonable to say that the space group is determined only when a structure is found which is in satisfactory agreement with the data. We should remember that *probable space group* means just that.

This work was performed under the auspices of the U.S. Atomic Energy Commission.

Acta Cryst. (1956). **9**, 200

Sur quelques composés du type M_2O_3-Cu_2O.

Par CLAUDE DELORME, *Laboratoire d'Électrostatique et de Physique du Métal, Institut Fourier, Grenoble, France*

(*Reçu le* 19 *septembre* 1955)

La structure du composé Fe_2O_3–Cu_2O est connue depuis longtemps (Soller & Thomson, 1935): rhomboèdrique, groupe d'espace $R\bar{3}m$–D_{3d}^5, Cu en (0, 0, 0), Fe en $(\frac{1}{2}, \frac{1}{2}, \frac{1}{2})$, 2 O en $\pm(\frac{1}{9}, \frac{1}{9}, \frac{1}{9})$. Confirmation en a été donnée par Pabst (1946*a*, *b*). Nous-mêmes avons précisé (Delorme & Bertaut, 1953) par un calcul d'énergie électrostatique que la formule la plus probable était $Fe^{+++}Cu^{+}O_2^{--}$.

D'autres composés isomorphes ont déjà été signalés: Co_2O_3–Cu_2O (Bertaut & Delorme, 1954) et Cr_2O_3–Cu_2O (Stroupe, 1949); pour ce dernier l'auteur ne donne pas le groupe d'espace.

Nous avons pu en obtenir un nouveau: Al_2O_3–Cu_2O par décomposition et chauffage à 1200° C. à l'air d'un mélange de nitrates d'aluminium et de cuivre.

Le Tableau 1 rassemble les divers résultats.

Pour Cr_2O_3–Cu_2O à la suite d'une étude paramagnétique effectuée avec R. Benoît nous avons obtenu une droite correcte de Curie–Weiss d'où l'on déduit la constante de Curie moléculaire $C_m = 1{,}74$, un moment effectif de $3{,}74\mu_B$ et une température de Curie paramagnétique de −178° K. Ce résultat confirme l'hypothèse de la formule $Cr_2^{+++}Cu_2^{+}O_4^{--}$, attribuant le moment théorique de $3{,}87\mu_B$ à l'ion Cr^{+++}.

Je remercie M. Bertaut, maître de recherches, pour ses conseils au cours de cette étude.

Bibliographie

BERTAUT, F. & DELORME, C. (1954). *C. R. Acad. Sci., Paris*, **238**, 1829.

DELORME, C. & BERTAUT, F. (1953). *J. Phys. Radium*, **148**, 129.

PABST, A. (1946*a*). *Bull. Geol. Soc. Amer.* **56**, 1187.

PABST, A. (1946*b*). *Amer. Min.* **31**, 202, 539.

SOLLER, W. & THOMSON, A. J. (1935). *Bull. Amer. Phys. Soc.* **10**, 17.

STROUPE, J. D. (1949). *J. Amer. Chem. Soc.* **71**, 569.

Tableau 1

	Paramètres				
Composé	Notation hexagonale	Notation rhomboèdrique	Distance M–O (Å)	Rayon ionique M^{+++} (Å)	Distance Cu–O (Å)
Fe_2O_3–Cu_2O	$a = 3{,}03$, $c = 17{,}09$ Å	$a = 5{,}96$ Å, $\alpha = 29°\,26'$	1,99	0,67	1,90
Co_2O_3–Cu_2O	$a = 2{,}85$, $c = 17{,}16$ Å	$a = 5{,}95$ Å, $\alpha = 27°\,42'$	1,90	0,58	1,90
Cr_2O_3–Cu_2O	$a = 2{,}97$, $c = 17{,}07$ Å	$a = 5{,}94$ Å, $\alpha = 29°$	1,96	0,64	1,90
Al_2O_3–Cu_2O	$a = 2{,}86$, $c = 16{,}94$ Å	$a = 5{,}88$ Å, $\alpha = 28°\,8'$	1,90	0,58	1,88