

1. Chanda, S. R., Hirst, E. L., Percival, E. G. V. and Ross, A. G. *J. Chem. Soc.* **1925** 1833.
2. Fischer, F. G. and Dörfel, H. *Z. physiol. Chem. Hoppe-Seyler* **302** (1955) 186.
3. McDowell, R. H. *Chem. & Ind. London* **1958** 1401.
4. Haug, A. *Viscosity of Alginate Solutions*. In Report No. 20, Norwegian Institute of Seaweed Research, Trondheim 1958.

- 4 V_1 : $x = 0.088$, $y = 0.250$, $z = 0.464$
- 4 V_2 : $x = 0.412$, $y = 0.250$, $z = 0.536$
- 4 V_3 : $x = 0.000$, $y = 0.750$, $z = 0.250$
- 4 O_1 : $x = 0.04_4$, $y = 0.60$, $z = 0.10_2$
- 4 O_2 : $x = 0.13_2$, $y = 0.10$, $z = 0.31_1$
- 4 O_3 : $x = 0.36_1$, $y = 0.90$, $z = 0.18_2$
- 4 O_4 : $x = 0.45_2$, $y = 0.40$, $z = 0.39_1$
- 4 O_5 : $x = 0.25_2$, $y = 0.40$, $z = 0.00_2$

Received February 13, 1959.

Note on the Crystal Structure of Trivanadium Pentoxide

STIG ÅSBRINK, STIG FRIBERG
and ARNE MAGNÉLI

*Institute of Inorganic and Physical Chemistry,
University of Stockholm, Stockholm, Sweden
and*

GEORG ANDERSSON

*Institute of Chemistry, University of Uppsala,
Uppsala, Sweden*

The existence of a vanadium oxide V_3O_5 has been reported in a previous communication¹. The compound was found to be monoclinic with the symmetry $C2/c$ or Cc and with the unit cell dimensions

$$\begin{array}{ll} a = 9.98 \text{ \AA}, & b = 5.03 \text{ \AA}, \\ c = 9.84 \text{ \AA}, & \beta = 138.8^\circ. \end{array}$$

Slight deviations in the parameter values have been observed indicating that the range of composition of the oxide has a finite width.

The observed density of 4.6 is in accordance with a unit cell content of 4 units of V_3O_5 (calculated density 4.75).

The crystal structure has been derived on the basis of single-crystal data registered by one of us (G.A.) using MoK radiation. The following preliminary parameter values were thus obtained:

12 V and 20 O in 8 sets of point positions 4(a) of space-group Cc (No. 9): $(0,0,0; \frac{1}{2}, \frac{1}{2}, 0) + x, y, z; x, y, \frac{1}{2} + z$.

The arrangement of the metal atoms is centrosymmetrical ($C2/c$) while that of the oxygen atoms (derived by S.A.) is not.

The structure is built up of VO_5 octahedra which are mutually joined by sharing corners, edges and faces. By means of the latter kind of connection, "double-octahedra" (containing V_1 and V_2 atoms) result which are similar to those occurring in the corundum-type structures, e.g. V_2O_5 . The "double-octahedra" are mutually joined by edges to form parallel rows extending infinitely through the structure. These rows are coupled together by "single-octahedra" (containing V_3 atoms). The V—V distance of octahedra joined by faces is 2.74 Å, while the V—V distances of octahedra sharing edges are 2.96 and 3.10 Å. The V—O and O—O distances, which so far are less accurately known, occur within the ranges 1.9—2.2 and 2.5—3.1 Å, respectively. Refinement of the structure is in progress.

X-Ray studies at temperatures up to 1 000°C did not show any indications of phase transformations in V_3O_5 .

The structure of V_3O_5 is essentially different from those of low- and high- Ti_3O_5 ². The V_3O_5 structural type has, however, been found to be present in a phase $TiCr_2O_5$ obtained in low yield by melting a mixture of the pure oxides in an electric arc furnace under an inert atmosphere³. (This phase seems to be stabilized by minor contents of aluminium.)

This investigation has been sponsored in part by the *Swedish Natural Science Research Council* and in part by the *Office, Chief of Research and Development, U.S. Department of Army*, through its European Office.

1. Andersson, G. *Acta Chem. Scand.* **8** (1954) 1599.
2. Åsbrink, S. and Magnéli, A. *To be published*.
3. Åsbrink, S. *Unpublished results*.

Received February 14, 1959.