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Ethanolamine hydrogen *d*-tartrate: optical properties and X-ray diffraction data.*

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Ethanolamine hydrogen *d*-tartrate, $C_6H_{13}NO_7$, may be crystallized from an aqueous solution containing the appropriate proportions of ethanolamine and *d*-tartaric acid.

The crystals, which are piezoelectric, belong to the monoclinic sphenoidal class and have the appearance shown in Fig. 1 (*a*), the sphenoids {011} and {1$\bar{1}$0} defining

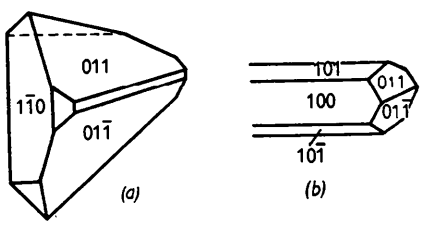

Fig. 1. Crystal habit.

the general shape of the crystals. When grown rapidly from a highly supersaturated solution, however, needles with pronounced pinacoids {100}, {101} and {10$\bar{1}$} are formed (Fig. 1 (*b*)).

The principal X-ray diffraction data and optical properties of these crystals are given below and in Table 1.

$C_6H_{13}NO_7$. Molecular weight = 211·2.

Density (18° C.) = 5·51 g.cm.$^{-3}$.

Table 1. *Principal 'powder' lines.*

(Intensities visually estimated; *d* not corrected for absorption).

d (Å)	Intensity	*d* (Å)	Intensity
7·64	*w*	3·34	*s*
5·92	*s*	3·22	*m–s*
5·75	*w*	3·12	*w*
5·59	*w*	2·96	*w*
5·34	*m*	2·86	*w–m*
4·65	*m*	2·81	*w–m*
4·40	*m*	2·67	*m*
3·90	*m*	2·63	*w*
3·81	*vs*	2·40	*w–m*
3·73	*m*	2·38	*m*
3·56	*w*	2·11	*w–m*
3·46	*m*		

(*w* = weak; *m* = medium; *s* = strong; *vs* = very strong)

Dimensions (±0·03 Å) of selected monoclinic structure cell:

$a = 8{\cdot}83$, $b = 7{\cdot}51$, $c = 7{\cdot}60$ Å; $\beta = 92°$.

Molecules per unit cell = 8 (calculated density = 5·57 g.cm.$^{-3}$).

Probable space group: $P2_1$–C_2^2: $0l0$ halved.

Cleavage: 001 (excellent).

Biaxial negative: optical axial angle ($2V$) approximately 19½° at 18° C. (sodium light).

Refractive indices (±0·001); sodium light; 18° C.:

$\gamma = 1{\cdot}551$ parallel to *b*.
$\beta = 1{\cdot}549$ parallel to *a* (to within ½°).
$\alpha = 1{\cdot}485$.

Dispersion: too weak for positive description.

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A simple mechanical structure-factor computing aid.

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A calculating analogue machine has been constructed which has proved useful in structure-factor calculations. It calculates simultaneously eleven values

$$C_n = \cos 2\pi(nu+m), \quad n = 0, 1, 2, \ldots, 10,$$

for any value of $0 \leqq u \leqq 1$ and $0 \leqq m \leqq 1$.

These two variables are fed into the machine by means of two hand-wheels. In order to reach a three-digit accuracy of setting, each variable is displayed on a pair of dials geared in a 1:10 ratio, the first dial reading the first digit, the second dial the second and third digits. The machine essentially consists of a 0:1:2:...:10 gear-box, in which the rotation *u* of the first hand-wheel is multiplied by *n* by a train of gears (see Fig. 1). The rotation *m* is then added to each product, for example by means of a differential. The sum $nu+m$ is then displayed as the angular displacement of the pointers on the eleven

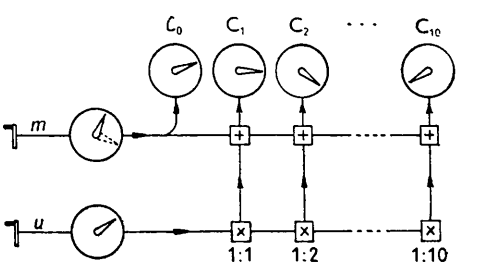

Fig. 1. Principle of the machine.

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