

It has been reported by Preston and Trotter⁵ and by Beevers⁶ that the symmetry of the Laue photographs of the cubic oxyacetate changes from $T_h - m3$ to $O_h - m3m$ in the interval 30–50° C. Jaffray⁷ made a thermal analysis and found that at $40.5 \pm 0.5^\circ$ C. there is a change in the heat capacity curve typical of the λ -type. According to Beevers, this change is due to a change in the parameter values of the carboxyl oxygen atom from $(-0.17, -0.06, -0.04)$ to $(-0.17, -0.05, -0.05)$, as the temperature passes the transition range, thus bringing all the oxygen atoms exactly to the (110) planes. We have re-examined the substance by the Laue photographic method and found that the holohedral symmetry is first attained at 60° C. Moreover, we have found on the photographs taken with the X-ray beam perpendicular to the (111) planes a number of diffuse spots, the intensities of which are enhanced considerably on passing the transition temperature.

A tentative theory is put forward. The symmetry of the molecule in the low-temperature form is $T - 23$, and the higher symmetry of the crystal $T_h - m3$ can be described as containing two kinds of molecules the mirror images of which are arranged regularly in accordance with the symmetry of the space group. If the packing of the molecules be kept as before but the two forms of the molecules be found at random, the symmetry of the crystal would attain the higher one $O_h - m3m$ in a statistical sense. This may be explained in another way as follows. The potential change associated with the rotation of the carboxyl group around the carbon-to-carbon bond parallel to the crystallographic axis would have a maximum when the oxygen atoms pass the (110) planes, and if the height of this barrier be low compared to the thermal energy, the oxygen atoms would pass over this barrier and arrive at another position of minimum energy which lies symmetrically to the (110) plane. This may transform the configuration of the molecule to its mirror image form if the change should occur simultaneously in six carboxyl groups within a molecule. Such may be the mechanism of the above-mentioned transformation.

Another modification of beryllium oxyacetate can be obtained by sublimation⁸. It is reported that this modification is birefringent and unstable at room temperature, transforming gradually when left by itself, or rapidly by grinding, into the cubic modification. The Laue rotating crystal and the moving-film goniometer photographs show that the crystal has a monoclinic unit with $a = 13.75$ kX., $b = 9.24$ kX., $c = 16.21$ kX., $\alpha = 98^\circ 55'$, $Z = 4$ (copper-K α radiation was used throughout), and the corresponding space group is one of $C_2^1 - Pm$, $C_2^1 - P2$ or $C_2^1 - P2/m$.

Detailed analyses of the structures of different modifications are now going on, and the results will be published later.

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- ¹ Timmermans, J., *J. Chim. phys.*, **35**, 331 (1939).
² Nitta, I., and Watanabé, T., *Bull. Chem. Soc. Japan*, **13**, 28 (1938).
³ Oda, T., Iida, T., and Nitta, I., *J. Chem. Soc. Japan*, **64**, 616 (1943); Oda, T., and Watanabé, T., *ibid.*, **65**, 154 (1944); Oda, T., and Nitta, I., *ibid.*, **65**, 621 (1944) (in Japanese).
⁴ Oda, T., *X-rays*, **5**, 2 (1945) (in Japanese).
⁵ Preston, G. D., and Trotter, J., *Nature*, **151**, 166 (1943).
⁶ Beevers, C. A., *Nature*, **152**, 447 (1943).
⁷ Jaffray, J., *C.R. Acad. Sci., Paris*, **225**, 106 (1947).
⁸ "Gmelins Handb. anorgan. Chemie", 8 Aufl., **26**, 152 (1930).

We have carried out differential thermal analyses of beryllium oxyacetate in order to find accurate transition and melting points and also to examine the heat effect associated with these (Fig. 1). The

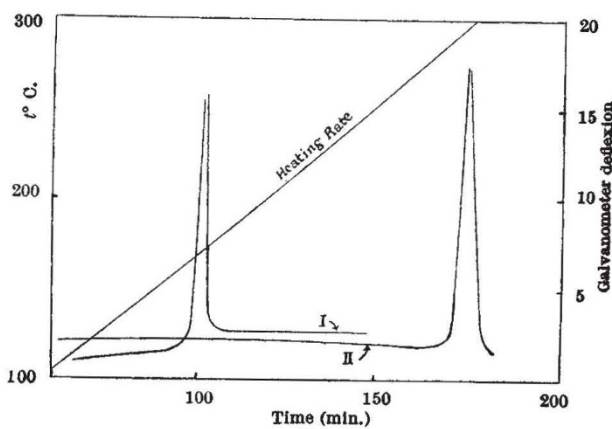


Fig. 1

observed transition and melting points are 148° C. and 286.7° C., respectively. If the sample is heated up to about 250° C. and then cooled to the room temperature, there is observed no transition phenomena in the cooling curve; this behaviour persists, for no transition phenomena is shown by the heating curve obtained on the next day (see curve II). But, when the sample is not heated beyond about 210° C., the transition in the heating curve made on the next day is always observed. The velocity of transition is accelerated by grinding the supercooled sample in an agate mortar. But this effect is somewhat complex. Details of the observation will be reported elsewhere. Comparison of the two peaks in the curves of the thermal analysis reveals that the heat of transition is nearly equal to the heat of fusion.

We have also made a dilatometric investigation. The results are shown in Fig. 2. It is found that the thermal expansion coefficient changes at four different temperatures, namely, 32° C., 42° C., 77° C. and 124° C. At all these temperatures except the

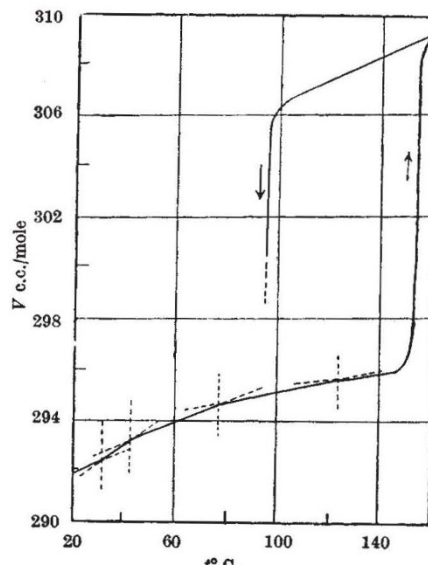


Fig. 2

first the expansion coefficient decreases on the high-temperature side. The second one corresponds to the temperature observed by Jaffray in his calorimetric measurement and reported as $40.5 \pm 0.5^\circ \text{C}$. The third of such changes is the largest, and the last is the smallest. The volume change at 148°C . is nearly 5.7 per cent of the volume at 25°C . Numerical data of these changes and the volume change at the melting point not described here will be given elsewhere.

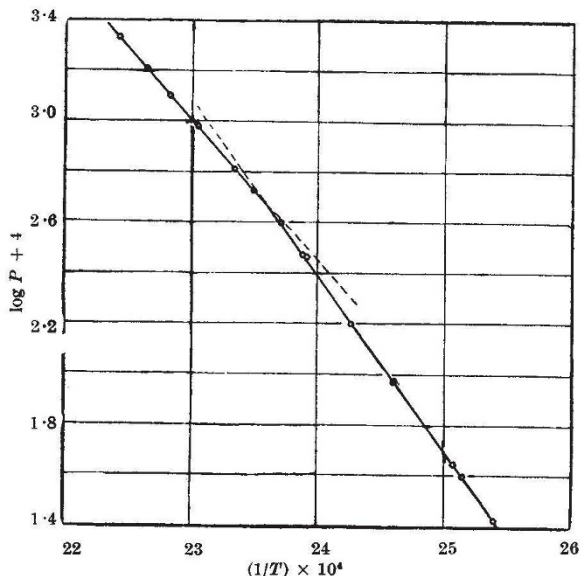


Fig. 3

We have also measured the sublimation pressure of this substance below and above the transition points by the effusion method. The vapour pressure equation obtained below the transition point is $\log P = -6934.8/T + 15.0299$, and above is $\log P = -5922.8/T + 12.6266$ (Fig. 3). From these equations, the heat of sublimation and of transition as well as the entropy changes are calculated (see table). The entropy change at the melting point is calculated by comparing the areas of the two peaks in the curve of the thermal analysis with the heat of transition obtained from the vapour-pressure measurement. These entropy data seem to explain why this substance has a very narrow range of liquid state in contrast to other members of the homologous series.

ΔH_{subl} , kcal. mole	ΔH_{trans}	ΔS_{trans} , e.u.	ΔS_{fusion}
31.7 (low-temp. phase)	4.6	11.0	11.6
27.1 (high-temp. phase)			

We are now attempting to measure the heat capacity of this substance. Discussion of the mechanism of this transition phenomena will be given later.

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SEED STORAGE OF INDIAN FOREST PLANTS

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MR. T. V. DENT, of the Indian Forest Service, has published some valuable information on the theoretical and practical aspects of seed storage, together with a discussion of the near-related principles of the duration of seed viability, dormancy, germination and the testing of seeds (*Indian Forest Record*, (New Series): *Sylviculture*, vol. 7, No. 1 (Manager of Publications, Delhi)). In addition, an attempt is made to screen and correlate all available information on the duration of vitality and on the storage of seed of Indian forest plants.

Mr. Dent writes that it is suggested that the time is now ripe for the initiation of a carefully prepared programme of research into storage of seed and near-related problems, in particular pre-sowing treatments for seeds which are difficult to germinate. Action should be initiated by the central sylviculturist, and an all-India plan of action should be devised, with the co-operation of provincial forest research officers. The shortcomings of our past methods, and the lacunæ in our knowledge of seed storage matters, are revealed by the information tabulated in this record. Here we have our starting point for planning the investigations of the future.

The monograph is divided into two parts, of which Part 1 deals with general principles relating to seed storage and is divided into nine sections covering the following: the practical importance of tree seed storage in forestry, the germination of seeds, dormancy, the duration of seed viability, the collection and extraction of tree seed, methods of seed storage, the protection of stored seed from pests, the transportation of seed and the testing of tree seed. Part 2 deals with available seed storage data for Indian forest plants and includes two tables presenting in summarized form all the principal information which is at present available on the storage and longevity of the seed of Indian forest plants.

In Great Britain it is understood how important is a knowledge of how to store seed of forest trees. It is not surprising, therefore, that India has had to consider this matter carefully, since a very much larger number of tree seeds, both indigenous and exotic, are made use of in the sub-continent of India; at the present time, at least 20,000 acres of land are artificially afforested a year, and under new proposals this area may be very considerably enlarged.

FORTHCOMING EVENTS

(Meetings marked with an asterisk * are open to the public)

Monday, February 7

INSTITUTION OF ELECTRICAL ENGINEERS, EDUCATION DISCUSSION CIRCLE (at Savoy Place, Victoria Embankment, London, W.C.2), at 6 p.m.—Discussion on "Electrical Engineering taught to other than Electrical Engineers" (to be opened by Prof. A. A. Hall and Mr. H. C. Mann).

MANCHESTER GEOGRAPHICAL SOCIETY (at the Geographical Hall, St. Mary's Parsonage, Manchester), at 6.30 p.m.—Miss Dorothy M. Scott: "Southern Rhodesia and the Cape".

TEXTILE INSTITUTE (joint meeting with the SOCIETY OF DYERS AND COLOURISTS and the SOCIETY OF CHEMICAL INDUSTRY, at 16 St. Mary's Parsonage, Manchester), at 7.15 p.m.—Dr. E. S. Paice: "Detergents".

CHEMICAL SOCIETY, OXFORD SECTION (in the Physical Chemistry Laboratory, Oxford), at 8.15 p.m.—Prof. C. A. Coulson: "Localized and Non-Localized Bonds" (Alembic Club Lecture).

ROYAL GEOGRAPHICAL SOCIETY (at Kensington Gore, London, S.W.7), at 8.15 p.m.—Mr. A. B. Crawford: "The Life of the Tristan Islanders".