

Table 2. X-ray diffraction data

KNO <sub>3</sub> -I			
hkl	$d_{\text{calc}}$ (Å)	$d_{\text{obs}}$ (Å)	$I/I_0^*$
014	3.37	3.39	100
006	3.22	3.13	5
110	2.71	2.71	9
022	2.28	2.28	13
108	2.15	2.16	22
024	2.112	2.111	7
116	2.075	2.074	10

Cell constants:  $a_0 = 5.42_3$  Å,  $c_0 = 19.33_3$  Å.  
Temperature 133°C, Pressure 1 bar.

KNO <sub>3</sub> -III			
hkl	$d_{\text{calc}}$ (Å)	$d_{\text{obs}}$ (Å)	$I/I_0^*$
102	4.15	4.10	3
014	3.21	3.20	100
006	2.92	2.92	65
110	2.72	2.73	16
022	2.27	2.28	19
024	2.074	2.074	37
108	1.986	2.015	58
116	1.990		
124	1.650	1.652	16
306	1.383	1.389	8

Cell constants:  $a_0 = 5.44_0$  Å,  $c_0 = 17.51_6$  Å.  
Temperature 133°C, Pressure 2500 ± 500 bars.

\* Relative peak heights.

would not be expected to represent either the same absolute dimensions or same axial ratio that the cell would have at other temperatures and pressures. The data of this paper show that there is a relatively large compression parallel to the *c*-axis of phase III in going from atmospheric pressure (Barth's data) to 2500 bars (our data). The large compression along the *c*-axis as compared to that along the *a*-axis is expected in light of previous high-pressure work with KNO<sub>3</sub> and CaCO<sub>3</sub> (DAVIS<sup>(8)</sup>).

The pressure existing at the equilibrium boundary I-III at 133°C is 500 bars. When the specific volumes of each phase are corrected to this point we have for phase I,  $v = 0.48_7$  cm<sup>3</sup>/g, and for phase III,  $v = 0.45_1$  cm<sup>3</sup>/g, giving a  $\Delta v$  of 0.03<sub>6</sub> cm<sup>3</sup>/g.

#### SUMMARY

Observations on transition rates across the boundaries of the KNO<sub>3</sub> phase diagram have been obtained using a beryllium pressure vessel wired for heating to moderate temperatures. The rates are

determined by continuous scan by X-radiation passing through the walls of the vessel.

Most of the curves obtained show decreasing rates near completion of the transition, resulting in transition orders lying between 1 and 2. However, changes studied near the triple-point I-II-III were complicated by the metastable appearance of phase III, both with increasing temperature and decreasing temperature across the point. The persistence of phase III in the phase II field becomes greater with lowering temperature and increasing pressure.

The I-II and III-II transitions often result in preferred orientation of the aragonite-type phase (II) with the 010 or 110 cleavages, or both, lying normal to the direction of applied load.

It is suspected that the elimination of such rate-modifying factors as nucleation and strain may be responsible for the tail-off observed in nearly all of the transition curves measured.

KNO<sub>3</sub>-I at  $t = 133^\circ\text{C}$  and  $P = 1$  bar has cell constants  $a_0 = 5.42_3$  Å,  $c_0 = 19.33_3$  Å ( $Z = 6$ ) using the hexagonal pseudo-cell of calcite. Constants for KNO<sub>3</sub>-III at  $t = 133^\circ\text{C}$  and  $P = 2500 \pm 500$  bars are  $a_0 = 5.44_0$  Å,  $c_0 = 17.51_6$  Å ( $Z = 6$ ) referred to the same cell. The specific volume decrement,  $\Delta v$ , at the transition boundary ( $t = 133^\circ\text{C}$   $P = 500$  bars) is 0.03<sub>6</sub> cm<sup>3</sup>/g.

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