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Note

DETERMINATION OF THE SPECIFIC HEATS OF ORTHOTELLURATES

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In the literature [1–3], seignette and antiseignette properties were established for a number of compounds with a perovskite-type structure containing Te^{6+} ions. A conclusion was made as to the seignette-active role of the tellurium sublattice made up of relatively small-size, $P_{Te^{6+}} = 0.56$ Å, highly polarized, high-charge cations.

As far as the other properties of orthotellurites are concerned, there are only few investigations. We published a method for synthesizing orthotellurites as well as our results on the crystallographic parameters of the compounds obtained and their thermal dissociation [4]. This work presents our results for the specific heats of these compounds.

EXPERIMENTAL, RESULTS AND DISCUSSION

The synthesis of orthotellurates and the methods of chemical and X-ray analyses are described in ref. 4. According to the chemical and X-ray analysis data, these compounds pertain to the corresponding orthotellurates given in Table 1.

The specific heats of orthotellurates were determined using the technique described in ref. 5 by heating the samples over the interval 400–540°C at a rate of 1° min^{-1}. Al_2O_3 was used as a reference substance. The results were analysed by the least-squares method with an Izot-310 computer using the FORTRAN-IV program, and were described by the equation $c_p = a + bT + cT^2$. The coefficients for the various orthotellurates are given in Table 1. A comparison of the experimental c_p values with those calculated by the equations found shows that they differ by no more than 0.25%. At 170°C there is a maximum on the curve for the temperature dependence of the thermal capacity at constant pressure, $c_p = f(T)$, for the Pb_3TeO_6 crystals (Fig. 1 and Table 2).

These results and those of the high temperature X-ray analyses make it possible to suppose that at 170°C Pb_3TeO_6 undergoes a first-order, irreversi-

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TABLE 1

Coefficients of the equation $c_p = a + bT + cT^2$ for the temperature dependence of the heat capacities of orthotellurates (cal mol^{-1} K^{-1})

Compound	a	b	c
Cu_3TeO_6	47.570	1.392×10^{-2}	2.720×10^{-6}
Zn_3TeO_6	10.767	13.876×10^{-2}	-9.789×10^{-5}
Cd_3TeO_6	68.359	-8.481×10^{-2}	1.588×10^{-4}
Al_2TeO_6	25.145	5.174×10^{-2}	-1.510×10^{-5}
Ga_2TeO_6	58.124	-7.848×10^{-2}	1.232×10^{-4}
In_2TeO_6	63.718	-8.612×10^{-2}	1.068×10^{-4}
Tl_2TeO_6	79.591	-14.355×10^{-2}	1.755×10^{-4}
Bi_2TeO_6	61.276	-7.149×10^{-2}	1.084×10^{-4}
$Bi_6Te_2O_{15}$	91.008	2.395×10^{-2}	6.333×10^{-5}

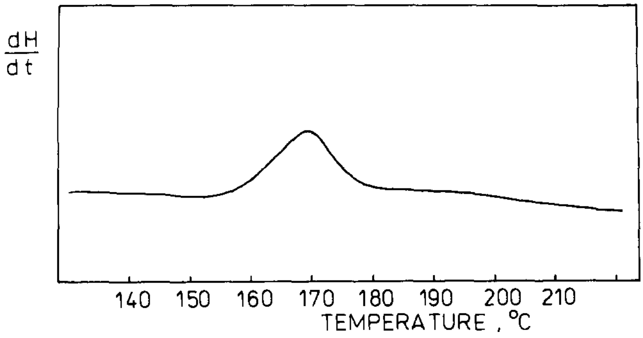

Fig. 1. DSC curve for Pb_3TeO_6 at a heating rate of 5° min^{-1}.

TABLE 2

Heat capacity of Pb_3TeO_6 at different temperatures (cal mol^{-1} K^{-1})

Temp. (K)	400	420	440	460	480	500	520	540
Heat capacity	44.564	46.236	51.533	47.207	46.636	45.897	45.703	45.330

ble phase transition which is most probably connected with a seignette-electric state arising. The enthalpy of the transition is $\Delta H = 50 \pm 1.5$ cal mol^{-1}.

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