INVESTIGATION OF HIGH PRESSURE PHASES OF CESIUM BY THERMOEMF MEASURING

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Cesium is interesting object to investigate kinetic properties under high pressure among alkali metals. Character of structure transitions and electron properties of cesium differ from “simple” behavior of normal metals under the pressure [1].

There were determined pressure direct phase transitions (I-II-III-IV) and crystal structures of these phases. For a long time the II-III phases transition was considered as isostructure FCC-FCC transition and it stimulated many workes about electron 6s-5d transition at this pressure. In last time there was estimated, that phase III has more complex structure [2]. The thermoemf is most sensitive electron property of metals. It has negative sign for normal metals usually. But some of monovalent metals have positive sign of thermoemf (Cu, Ag, Au, and Li [3]). It excites interest for theoretics. Measuring the thermoemf of Cs under pressure up to 0.3 GPa [4] give the results, that sign of the thermoemf exchange from negative to positive. It was one of reason to measure the thermoemf under high pressure.

The thermoemf measuring of polycrystal Cs was carried out with high pressure apparatus “Toroid” [5], that permit to make investigations both pressure increase and pressure decrease. This measuring method is such, as in work [3] for Li.

Results of the measuring at room temperature represent on fig. 1. The thermoemf of phase I strongly increase under pressure and reaches maximum of 18 μV/K before I-II phases transition. This transition is accompanied by sharp decrease of the thermoemf to 10.5 μV/K. Thermoemf of II (FCC) phase decreases to 6 μV/K, when pressure increases to 4.3 GPa, where III phase is formed. Thermoemf of this phase decreases slightly under pressure. III-IV transition is accompanied by small increase of the thermoemf. Thermoemf of the IV phase decrease slightly and reaches a value of 5 μV/K at pressure of 7 GPa.

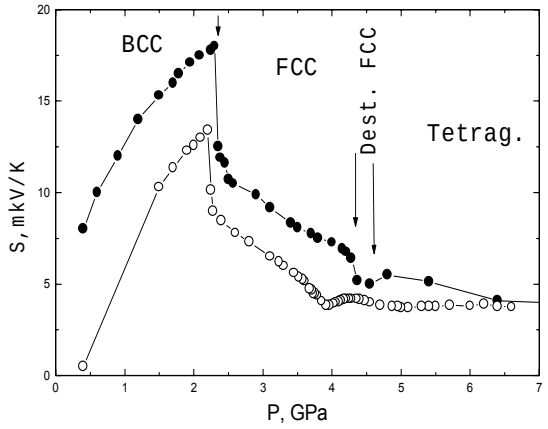

Fig.1. Thermoemf dependence from pressure.
● –pressure increase,
○ –pressure decrease.

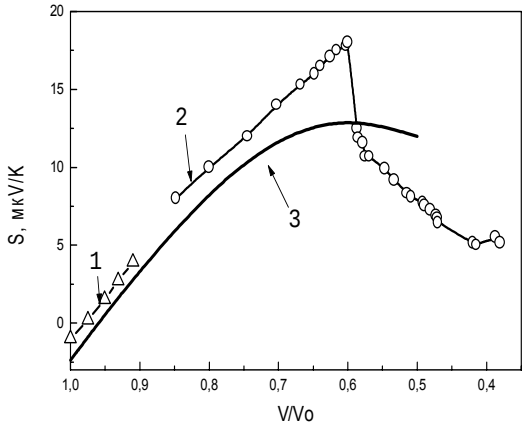

Fig.2. Thermoemf dependence from volume.
1 – datum of work [4], 2 – this work datum,
3 – theoretical calculate [6].

Thermoemf of Cs, measured at pressure decrease, qualitatively coincide with it, measured at pressure increase.

Experimental datum under pressure up to 0.3 GPa [4] allowed authors of work [6] to make theoretical calculation of thermoemf dependence on volume of Cs. (fig.2). Results of our work good agree with results of work [4]. It is strikely, that this theoretical calculation agrees with experimental measurements.

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