

# HEAT CAPACITY OF IONS CADMIUM AND BARIUM IN DIMETHYLSULFOXIDE AT 298,15 K

*Rakhmanova P.A.,<sup>1</sup> Vasilyov V.A.,<sup>1</sup> Solovyov S.N.,<sup>1</sup>  
Novikov A.N.,\*<sup>2</sup> Doronin Ya.I.,<sup>2</sup> Skorba V.R.<sup>2</sup>*

<sup>1</sup>*MUCTR, Moscow, Russia, <sup>2</sup>NI MUCTR, Novomoskovsk, Russia*  
*\*anngic@yandex.ru*

The heat capacity reflect the energy and structural changes during the formation of solutions; the thermodynamic characteristics of electrolytes and ions calculated from these characteristics allow us to reveal the peculiarities of ion-molecular interactions and evaluate the solvation effects on the physicochemical properties of various liquid systems. In the present work, the heat capacity of dimethylsulfoxide (DMSO) solutions of barium and cadmium iodides were studied for the first time with high accuracy. The heat capacity of the solutions was studied in a sealed calorimeter with an isothermal coating and a platinum thermometer, whose resistance was determined using a bridge circuit. The error of heat capacity was 0,001 J / (g K). The apparent molar heat capacities of barium and cadmium iodides in DMSO were calculated from the experimental data. To determine the standard partial molar quantities corresponding to an infinitely dilute solution, the concentration dependences of apparent molar heat capacities were approximated by the linear equation. The standard partial molar heat capacity of barium and cadmium iodides were separated into ionic components based on the additivity of the partial molar quantities and literature value of heat capacity for the iodide ion in DMSO. The standard values of heat capacity of barium and cadmium ions are equal respectively -133 and -126 J/(mole K). The standard partial molar heat capacity of ion can be represented as the sum of contributions of the intrinsic heat capacity of the ion in solution and changes in the heat capacity of the solvent due to solvation, rearrangement of the primary structure, and specific interactions with ions. The latter contribution is characteristic only for complexating ions, in particular, cadmium ion. The barium and cadmium ions, however, differ significantly in size, while having the same charge; that is why all other components of standard partial molar heat capacity also differ for these ions, and a comparison of these characteristics allows, in our opinion, only qualitative evaluation of the contribution of the specific interactions of the cadmium ion with DMSO molecules. As in N-methylpyrrolidone solutions, the specific interactions of the cadmium ion with the solvent molecules do not lead to any significant change in heat capacity.