Isochoric Heat Capacity of the H2O - N-C6H14 System in the Concentration Interval 0.615 - 0.935 Mole Fraction of H2O

Gennadii Stepanov, Sadiya Orakova, Elena Bezgomonova and Mihail Rabezkii
Institute of Physics, Dagestan Science Centre of Russian Academy of Sciences, Makhachkala, Dagestan, Russia

The isochoric heat capacity of the H2O – n-C6H14 system in the concentration interval 0.615 – 0.935 mole fraction of H2O is investigated by means of a high temperature adiabatic calorimeter of constant volume. In this interval the isochoric heat capacity along isochors undergoes two step-wise changes caused by the phase transitions from liquid – liquid and liquid – vapor. With increasing temperature along the isochore in the three-phase system water – n-hexane – vapor there occurs a phase transition from liquid – vapor of the hydrocarbon-weak solution at the liquid phase of water. Next here is observed a phase transition from liquid – liquid and the system becomes a solution. The measurements are carried out with vigorous stirring of the system. The phase transition temperatures are determined by heat capacity jumps. The experiments measuring the isochoric heat capacity of H2O – n-C6H14 at compositions: 0.615, 0.854, 0.935 mole fraction of H2O show that the liquid – vapor coexistence curve for these concentrations is exceedingly similar to the coexistence curve of pure n-hexane. The difference is only that with increasing water concentration the curve peaks shift toward large densities. Analysis of obtained values reveals the results: for composition 0.615 mole fraction of H2O $\beta = 0.383 \pm 0.003$, $B = 2.06 \pm 0.03$, for composition 0.935 mole fraction of H2O $\beta = 0.379 \pm 0.07$, $B = 1.112 \pm 0.036$. The exponential quantity of the coexistence curve of liquid – vapor in the three-phase system is consistent with the theoretical value $\beta = 0.325$ for solutions within the calculation and experimental errors. $\beta$ for these solutions is higher, which may be connected with the increase of mass exchange in the vapor phase region.