Vapor Pressure of the (Lithium Bromide + Zinc Chloride + Methanol) System

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The vapor pressure p measurements of $LiBr/ZnCl_2$ + CH_3OH solutions at T = (298.15 to 323.15) K in three mole fraction rates of salts were studied for the application of these solution in absorption refrigeration machines and heat pumps. The use of CH_3OH as solvent enables one to replace aqueous solutions at temperatures below the freezing point of water. Investigations were carried out for the $LiBr/ZnCl_2$ (2/1) + CH_3OH in $w_{\mathrm{CH_3OH}}$ =(0.5324 to 0.9586), for the $LiBr/ZnCl_2$ (1/1) + CH_3OH in $w_{\mathrm{CH_3OH}}$ =(0.5942 to 0.9472) and for the $LiBr/ZnCl_2$ (1/2) + CH_3OH in w_{CH_3OH} =(0.4745 to 0.9655) mass fractions of methanol.

The experiments were performed in a glass cell by using a static method. The experimental setup consisted of a bolted-top cell with internal volume of 95.64 cm^3 placed in a water bath, which is kept at constant temperature (±0.02 K) using a thermostat. The internal volume of the measuring cell consists of: 78.56 cm^3 volume of the glass cell and 17.08 cm^3 volume of the steel tubes cell. The temperature inside the cell was measured by a platinum resistance thermometer PT-100 (Type 42441-V100), connected to the signal conditioner Kelvimat Type 4303, with an accuracy of T= ±0.01 K. The pressure was measured using a calibrated high accuracy sensor head [Type 615A connected to the signal conditioner Type 670A, MKS Baratron] attached to the top of the cell. The sensor head and the connecting line from the cell to the sensor were thermostated at T=333.15±0.01 K. The experimental uncertainties were ΔT= ±0.01 K for temperature and Δp= ±10 Pa for pressure.

The experimental vapor pressure results of the investigated solutions were fitted to the Antoine-type equation, which express vapor pressure as a function of temperature and mass fraction of methanol:

$$\lg[p/\mathrm{Pa}] = A + B/[(T/\mathrm{K}) - 43.15] \tag{1}$$

where p is the vapor pressure, T absolute temperature, and w the mass fraction of methanol. The empirical coefficients A and B determined by the least-squares method and depend from the mass fraction of methanol:

$$A = \sum_{j=0}^{5} a_i \cdot (10^2 \cdot w)^i \tag{2}$$

$$B = \sum_{j=0}^{5} b_i \cdot (10^2 \cdot w)^i \tag{3}$$