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THERMODYNAMIC CHARACTERISTICS OF INTERACTIONS OF ALIPHATIC AMIDES WITH SOME HYDROPHILIC NON-ELECTROLYTES IN WATER

The studies of the solvation of hydrophobic solutes in aqueous mixed solvents were carried out as a part of research programme concerning the investigations of thermodynamic properties of amides solutions. The standard enthalpies of solution of formamide (FA), acetamide (AA), N-methylformamide (NMF), N-methylacetamide (NMA), N,N-dimethylformamide (DMF), N,N-dimethylacetamide (DMA), N,N-diethylformamide (DEF), N,N-diethylacetamide (DEA) and N,N-dimethylpropionamide (DMP) in aqueous solutions of 1,2-ethanediol (ED) and formamide (0 – 4 mol ED or FA /kg H_2O) were determined at 298.15 K using isoperibol calorimeter. From these results the enthalpies of transfer of amides from water to mixed solvents H_2O – ED and H_2O – FA were calculated. The obtained results are discussed on the basis of idea about solute – solvent and solvent – solvent interaction in these mixtures. The disposition of enthalpies of transfer in order decreasing of exothermicity FA < AA < NMF < NMA, DMF < DMA < DEF, DMP < DEA is determined by these factors. The enthalpies of transfer were used to obtain enthalpic pairwise interaction coefficients h_{xy} of amides (x) with hydrophilic non-electrolytes (y) in water. The pairwise heterotactic interaction coefficients determined in this work are compared with those data of amides with urea [1].

The values of heterotactic coefficients $h_{x?}$ of amides with ED or FA are positive and increase with increasing size of the alkyl groups of amides. The reasons of these phenomena are discussed using results of Wood [2]. Correlation between heterotactic coefficients $h_{x?}$ and homotactic coefficients h_{xx} for amides in water is found. The relative hydrophobicity of amides increases in sequence FA < AA < NMF < DMF < DMA < DEF < DEA by using of values $h_{x?}$ by parameter of hydrophobic effects. It was shown that hydrophobic properties are increased in order of hydrophilic non-electrolytes (U, FA, ED). The values of coefficient $h_{x?}$ increase in sequence U < FA < ED that is caused by rise of hydrophobic contribution of interaction and decreasing of part from interaction of polar groups.

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[2] S.K.Suri, J.J.Spitzer, R.H.Wood, E.G.Abel, P.T.Thompson. J.Solut.Chem. 14 (1985), 781.