DIAGRAMS WITH DISTINGUISHABLE DEFORMATION OF RESIDUE CURVES OF ZEOTROPIC THREE-COMPONENT SYSTEMS

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The identification of possible structures of vapor-liquid equilibrium diagrams is fundamental importance for evaluating the possibility of using distillation separation of liquid mixtures. Based on a qualitative analysis, L.A. Serafimov developed a classification of three-component systems, including diagrams with distinguishable deformation of residue curves. These are diagrams in which the course of K = 1 lines (K is the distribution coefficient of the component between the vapor and liquid phases) are different, but the course of the residue curve is qualitatively the same [1]. Systems belonging to class 3.0.0–1 [2], were considered as ideal solutions, at the same time the lines of K limit values were assumed to be straight, and for this class of systems there were no diagrams with distinguishable deformation of residue curves [1].

In the basic organic synthesis industry, as is known, a vast majority of mixtures are non–ideal solutions, which can be either azeotropic or zeotropic systems. In this regard, this work is devoted to the analysis of the course of K = 1 lines in non–ideal systems of class 3.0.0–1. Based on the construction of the K surfaces traces on the prism faces, corresponding to the binary constituents of the three–component system, we identified diagrams with distinguishable deformation of residue curves, characterized, in particular, by the presence of one-sided K = 1 lines. Applying the method of mathematical modeling of vapor-liquid equilibrium, the implementation of one of synthesized diagrams corresponding to the benzene – 1,2-dichloroethane – 1,1,2-trichloroethane system, which is part of the chlorine–balanced production of vinyl chloride, was confirmed.

It should be noted that identified K = 1 lines diagrams play an important role in the analysis of the evolution of the vapor-liquid equilibrium diagram structures of three-component systems, especially in the implementation of ternary biazeotropy.

1. Serafimov L.A. Teoreticheskie principy postroeniya tekhnologicheskih skhem rektifikacii neideal'nyh mnogokomponentnyh smesej (Theoretical principles of constructing technological schemes for the rectification of non-ideal multicomponent mixtures) : Dis. ... Doctor of Technical Sciences: 05.00.00. – Moscow, 1968. 373 p.

2. Serafimov L.A. Thermodynamic and topological analysis of heterogeneous equilibrium diagrams of multicomponent mixtures // Russ. J. Phys. Chem. 2002. V 76, № 8. P. 1211–1224.