PREDICTION OF THERMODYNAMIC PROPERTIES AND PHASE EQUILIBRIA OF OIL HYDROCARBONS AND PETROLEUM PRODUCTS BASED ON THE MULTIPARAMETER FUNDAMENTAL EQUATIONS OF STATE

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Prediction of the thermodynamic properties and phase behavior of oil hydrocarbons and multicomponent hydrocarbon mixtures is a complex and not fully resolved problem. Information on the thermodynamic properties of hydrocarbon systems is necessary for the development of technology for the extraction, transport and processing of hydrocarbon raw materials. A wide range of operating parameters and hydrocarbon composition does not allow providing the needs of technological practice in information on the thermodynamic properties using only the experimental data. One of the ways to solve this problem is the development of analytical models based on fundamental equations of state, which on the one hand reliably reproduce the state surface, and on the other hand they allow calculating all thermodynamic properties with high accuracy. The report summarizes and presents the result of the work of the authors devoted to the development of fundamental equations of state of oil and gas condensates hydrocarbons. These individual and generalized equations of state formed the basis for the author's method for calculating the thermodynamic properties of complex hydrocarbon systems - oil and gas condensates of various fields, their fractions and different commodity products. The method is constructed within the framework of a single-fluid model with the use of minimal initial information about the physicochemical properties of the substance and its composition determined by standard laboratory methods. The authors also developed a procedure for transition from a single-fluid model to an ideal mixture model for predicting the phase behavior of complex hydrocarbon mixtures. Other mixture models that take into account the interactions of components or pseudo-components are considered. The report also discusses an alternative approach based on the application of the generalized equation of state obtained within the framework of the statistical associated fluid theory (SAFT) and provides high accuracy in calculating the thermodynamic properties and phase equilibria of hydrocarbon systems.