# FOREWORD

The design of new methods of the intensification of chemical production procedures, the choice of optimum ways to use raw materials, and the use of industrial wastes require more reliable knowledge on the properties of inorganic substances and their solutions. The lack of the systematized information on the physicochemical properties of multicomponent aqueous systems has become obvious.

This handbook is the continuation of a number of the author's books dealing with longstanding theoretical investigation of the structure and interparticle interactions in electrolyte aqueous solutions, computer and factographic representation of experimental data, and recommendations and the use of the methods of the calculation of the physicochemical properties of binary and multicomponent systems [1–27]. The main attention is given to the simplicity and accuracy of calculation formulas.

The accumulated experience allowed me to create the unified technique of the calculation of the physicochemical parameters of multicomponent systems with various combinations of independent variables such as temperature, pressure, and mass content. In this handbook, the most rationalized methods of the calculation of the physicochemical parameters of multicomponent systems are considered. A great number of coefficients in the calculation formulas and the calculation errors, which are refined by regression analysis of the available and our own experimental data, are given. The coefficients for the calculation formulas for the most widely used electrolytes are shown in a high-temperature region. Each method of the determination of a physicochemical parameter is illustrated by calculation examples.

In this handbook, original methods of the calculation of the physicochemical properties of multicomponent solutions with minimal errors are given. They allow the calculation of VOLUMETRIC PROPERTIES (density, apparent molar volume, apparent molar expansibility, and adiabatic apparent molar compressibility); EQUILIBRIA IN SOLUTIONS

(activity coefficients, water activity, and osmotic coefficients); PHASE EQUILIBRIA (vapor pressure over multicomponent solutions and boiling and freezing points); THERMAL PROPERTIES (heat capacity and apparent molar heat capacity); SOLUTION PROPERTIES (heat conductivity and surface tension); and TRANSPORT PHENOMENA (dynamic viscosity, electrical conductivity, and diffusion).

Models of the physicochemical properties of $1 + n$ component solutions are written as equations that allow the calculation of the properties of binary solutions (at $n = 1$). The ideology of deriving the coefficients of the calculation formulas is based on the mathematical processing of the experimental data for binary solutions, and the derived coefficients, in their turn, and the calculation methods allow the determination of the properties of multicomponent systems. All the calculation methods were tested during the mathematical modeling of various technological processes.

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I shall be grateful for any suggestions and comments.