

BOGOLYUBOV METHOD OF THE REDUCED DESCRIPTION AND INVARIANT MANIFOLDS OF A SYSTEM

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The basics of the Bogolyubov method of the reduced description of nonequilibrium processes are discussed [1] in a connection with his theory of dynamical systems [2] and the Chapman–Enskog method of solution of kinetic equations. The Bogolyubov idea of the functional hypothesis is compared with Poincare idea of the normal solutions of kinetic equations. It is claimed that reduced description of a system is an exact result related to the existence of its invariant manifolds. In this connection a problem of the effective initial conditions to time equations for the parameters of the reduced description (see about, for example, in [3]) is discussed. The Bogolyubov ideas are illustrated comparing his method of investigation of nonlinear oscillations and application of his method of reduced description to catalysis kinetics in the framework of the Michaelis–Menten model. Finally, status of quasi-equilibrium distributions in the theory of nonequilibrium processes and the Zubarev method of nonequilibrium statistical operator are discussed. The theory is illustrated by the results of a computer simulation.

1. Bogolyubov N. N. Problems of a Dynamical Theory in Statistical Physics. Studies in Statistical Mechanics, V.1. – Amsterdam: North-Holland, 1962, 118 p.
2. Bogolyubov N. N., Mitropolsky Yu.A. Asymptotic Methods in the Theory of Nonlinear Oscillations. – New York: Gordon & Breach, 1961, 548 p.
3. Akhiezer A. I., Peletminsky S.V. Methods of Statistical Physics. – Oxford: Pergamon Press, 1981, 376 p.