COMPOSITE-PARTICLE INTERACTION

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In the realistic approach the interaction of composite particles, i. e. particles consisting of some fermions-constituents, should be described through the interaction of these constituents. If the internal states of interacting particles are fixed, the resonating group model (RGM) [1] allows one to reduce the problem of description of their interaction to two-body one. However resulting two-body equation turns out to be not a Schrödinger one because it contains exchange integral kernels in all its terms. The methods of reduction of the RGM equation to the Schrödinger equation with a Hermitian Hamiltonian and various approximations of RGM which make it more or less similar to ordinary two-body approach are demonstrated. These approximations differ by methods of manipulation with the exchange terms. They are known under the unified name orthogonality conditions model (OCM) [2]. Physical consequences of the existence of these kernels in the equations of such a type are discussed. Bound (and weakly-bound in particular), continuous and resonance states are considered.

The algebraic version (AV) of OCM [3] is actively used because the exchange terms turn out to be separable components of the potential in this scheme. These terms are related to the forbidden by Pauli principle and so-called "semiforbidden" states.

For the heavy-ion interactions physics it is demonstrated in AV OCM that the values of the widths of narrow cluster-cluster (quasi-molecular) resonances are strongly affected by the exchange effects. For the neutron-induced reactions it is shown that the neutron-nucleus potential contains the separable components related to the semiforbidden states appearing due to the diffuseness of Fermi surface. That is also true for the electron-atom interaction.

1. Wheeler J.A. // Phys. Rev. 1937. V. 52. P. 1107.
2. Saito S. // Progr. Theor. Phys. 1969. V. 41. P. 705.
3. Igashov S.Yu. et al. // Bulletin RAS Ser. Phys. 2010. V. 74. P.1677.