Generalized Faddeev equations in the AGS form for deuteron stripping with explicit inclusion of the Coulomb interactions

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Deuteron stripping provides a unique tool for determining information on the neutron capture. Deuteron stripping processes off a target nucleus consisting of A nucleons are treated within the framework of the few-body integral equations theory. The theoretical description of reactions in general, and the theory for (d, p) reactions in particular, needs to advance into the new century.

The generalized Faddeev equations in the AGS form, which takes into account the target excitations, with realistic optical potentials provide the most advanced and complete description of the deuteron stripping. The main problem in practical application of such equations is the screening of the Coulomb potential, which works only for light nuclei. In this paper we present the AGS equations taking into account the target excitations with explicit inclusion of the Coulomb interaction. By projecting the (A + 2)-body operators onto target states, matrix three-body integral equations are derived which allow for the incorporation of the excited states of the target nucleons. Using the explicit equations for the partial Coulomb scattering wave functions in the momentum space we present the AGS equations in the Coulomb distorted wave representation without screening procedure. The derived equations are compact in the Hilbert space. We also use explicit expressions for the partial Coulomb scattering wave function and for the off-shell two-body Coulomb scattering T-matrix, which are needed to calculate the effective potentials in the AGS equations. We present the regularization of the effective potentials in the AGS equations to make the integration converged. For NN and nucleon- target nuclear interactions we use the separable potentials.