Generalized Faddeev equations in the Alt-Grassberger-Sandhas form for deuteron stripping with explicit inclusion of target excitations and Coulomb interaction

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Theoretical description of reactions in general, and the theory for (*d*,*p*) reactions, in particular, needs to advance into the future. Here deuteron-stripping processes off a target nucleus consisting of *A* nucleons are treated within the framework of the few-body integral equations theory. The generalized Faddeev equations in the Alt-Grassberger-Sandhas (AGS) form, which take 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. For the first time we present a formulation of the Faddeev equations in the AGS form 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. We also use the explicit expression for the off-shell two-body Coulomb scattering T matrix, which is needed to calculate the effective potentials in the AGS equations. The integrals containing the off-shell Coulomb T matrix are regularized to make the obtained equations suitable for calculations. For *NN* and nucleon-target nuclear interactions we assume the separable potentials what significantly simplifies solution of the AGS equations.

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