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Inelastic and Transfer Couplings in Nucleon Induced Reactions

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A microscopic calculation of the optical potential for nucleon-nucleus scattering has been performed by explicitly coupling the elastic channel to all the particle-hole (p-h) excitation states in the target. These p-h states may be regarded as *doorway states* through which the flux flows to more complicated configurations, and to long-lived compound nucleus resonances. The random-phase approximation (RPA) and the quasi-particle RPA (QRPA) provide linear combinations of p-h states that include the residual interactions within the target, and we show results for reaction cross sections using the QRPA description of target excitations of different nuclei and coupling to all open channels. We also included couplings to relevant pick-up channels, which were found to represent a very important contribution to a more accurate and realistic description of the reaction proccess. With this procedure we observed coupling and structure effects of the studied nuclei by comparing the different coupled-channel (CC) calculations results with predictions of a well-established optical potential and with experimental data. The effect of including couplings between excited states in CC calculations was also analyzed within the RPA context and its relevance was assessed. Prepared by LLNL under Contract DE-AC52-07NA27344. LLNL-ABS-414348

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