TRIUMF Advanced Rare Isotope Laboratory (ARIEL)

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Some recent advances in the description of exclusive and inclusive transfer reactions populating unbound states

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Reactions populating unbound states, such as transfer, breakup or knockout, provide valuable spectroscopic information of weakly bound nuclei. Extraction of meaningful information from these reactions require the combination of a suitable reaction framework, tailored to the reaction at hand, with a realistic structure model for the involved nuclei.

In this presentation, I will discuss some examples of this type of reactions, covering a variety of situations. Firstly, I will present the case of ^{9}Li(d,p)^{10}Li, measured at ISOLDE [1] and TRIUMF [2]. The angular distribution of outgoing protons and the excitation energy spectrum of ^{10}Li can be well described by DWBA and CCBA calculations combined with a relatively simple structure model of the ^{10}Li system, comprising s-wave virtual state and a p-wave resonance. Above $\sim$2 MeV, the data suggest the presence of d-wave strength [3,4]

As a second example, I will discuss the case of ^{17}C, recently studied at GANIL [5] by means of the ^{16}C(d,p)^{17}C reaction. In this case, the description of the excitation spectrum can be also well described with the inclusion of s and d waves, but requires a more elaborate structure model, including core deformation and Pauli blocking effects arising from the open shell nature of the ^{16}C {\it core}.

Finally, I will move to the case of the population of high-lying excited states, usually leading to inclusive measurements in which many partial waves are potentially involved and isolated states are not resolved. In this case, the modeling can be efficiently and elegantly performed making use of the Ichimura-Austern-Vincent (IAV) model [6], in which the states of the participant+target system are described in terms of an effective, complex potential, akin to that used in optical model calculations for elastic scattering. I will present some of examples of these inclusive, stripping reactions and stress their application to surrogate and incomplete fusion.

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