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Proton-induced knockout (p,2N) reactions on stable nuclei as a tool to determine spectroscopic factors

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Proton-induced knockout reactions provide a direct mean of studying the single particle or cluster structures of target nuclei. However, due to the nature of hadron probe, these reactions can suffer significant disturbances from the nuclear surroundings and the quantitative theoretical treatment of such processes can also be challenging. In this talk, firstly we review the experimental and theoretical progress in this field. The spectroscopic factors extracted using (p,2N) data at intermediate energies are consisted with those determined using (e,e'p) data, typically within a 15% deviation, when the geometrical parameters are the same as those employed in the (e,e'p) analysis. However, when the goal is to use the (p,2N) reactions as a spectroscopic tool, it is preferable to determine the geometrical parameters in a self-consistent manner. Thus we further performed a calculation using wave functions generated in a relativistic Hartree model. The spectroscopic factors deduced from this self-consistent calculation and from the previous standard calculation using a global optical potential agree with the relevant (e,e'p) results mostly within 15% for light nuclei. This result is encouraging for extending to similar studies of unstable nuclei, for which the properties are not well-known and the parameters for DWIA calculations cannot be pre-determined. However, those for the 208Pb target are significantly large compared with the (e,e'p) results. In this case, the DWIA results are very sensitive to the radius parameters of the bound-state potential, and thus a careful treatment is required.

Attendance Type

Remote

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