CDCC analysis for momentum distribution of ^{22}Mg in ^{23}Al+^{12}C reaction

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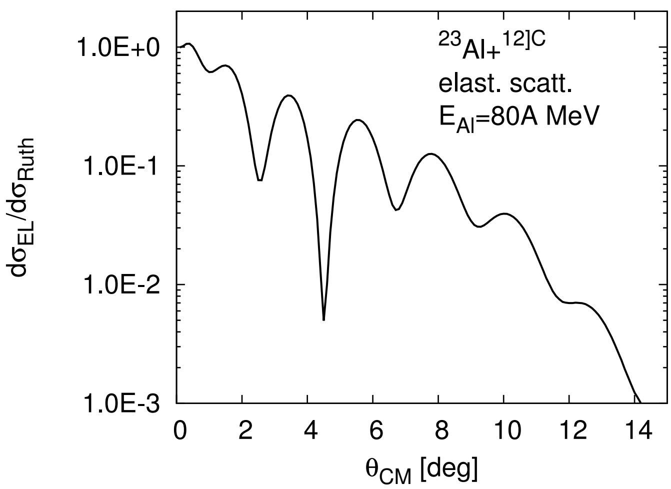
A Continuum Discretized Coupled Channels(CDCC)[1] program hctak was written and is used to analyze the momentum distribution of ^{22}Mg produced in ^{23}Al + ^{12}C reaction induced by using 74A MeV ^{23}Al beam and measured at 0°[2]. The reacting system is assumed to composed of a proton (particle 1), a ^{22}Mg(particle 2) and a ^{12}C(particle 3) nuclei. These three particles are assumed to have no excited states nor intrinsic spins. Introduction of intrinsic spins is not difficult, but is found to be too time consuming in actual computation.

Relative motion of particles 1-2 are solved by using a real potential, which reproduces the experimental d state binding energy of 0.125 MeV. Orbital angular momenta for 1-2 scattering states taken into the analysis are $l_{12} = 0, 1, \cdots 4$ and the maximum wave number of relative motion k_{12} is 2.5 fm^{-1}. Optical potentials used for 1-3 and 2-3 system are due to Watson et al.,[3] and to Beunerd et al.,[4]. The figure shows ratio to the Rutherford cross section of 80A MeV ^{23}Al+^{12}C elastic scattering cross section predicted by these assumptions. Total reaction cross section predicted is 1291 mb at 80A MeV, while Fang et al.,[2] give 1609 ±79 mb.



The triple differential cross section calculation is now in progress under limited range of k_{12} and showing that the experimental width of momentum spread may be explained.

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3 B. A. Watson, P. P. Singh and R. E. Segel, Phys. Rev. **182**, 977(1969)
4 M. Beunerd et al., Nucl. Phys. **A424**, 313(1984)