SPECTROSCOPIC STUDY OF THE INTRUDER STATES IN ^{12}BE VIA TRANSFER REACTION

Jie Chen, School of Physics, Peking University, Beijing, China

Jie Chen[1], Jianling Lou[1], YanlinYe[1], Zhihuan Li[1], Danyang Pang[3], N. Aoi[2], E. Ideguchi[2], K. Hatanaka[2], H. J. Ong[2], Yucheng Ge[1], Qite Li[1], Yelei Sun[1], Jing Li[1], Wei Jiang[1], Hongliang Zang[1], J. Tanaka[2], T. Yamamoto[2], T. Suzuki[2]

1 School of Physics, Peking University, Beijing, China
2 Reacher Center for Nuclear Physics, Osack university, Osaka, Japan
3 Beijing University of Aeronautics & Astronautics, Beijing, China

A remarkable phenomenon for the light unstable nuclei is the disappearance of the conventional magic numbers. Around neutron number N = 8, intruder of (sd)−shell neutrons into p−shell for ^{11}Be ground state has been well understood[1]. However, for ^{12}Be ground state (0^+_1) and excited state (0^+_2), controversial results exist in the literature, some giving large probability for intruder configurations ($2\hbar\omega$ or $(0s)^4(0p)^6(1s0d)^2$) [2-5] while others supporting the dominance of normal configurations ($0\hbar\omega$or $(0s)^4(0p)^8$) [6-7], both in theory and experiment. Especially, the spectroscopic factors abstracted from the transfer reactions are in conflict with many theoretical and experimental works and have been questioned from various sides [8].

In order to study the configurations of ^{12}Be, an experiment was designed, aiming at investigating the intruder s-wave strength in the ground state and low-lying excited states of ^{12}Be, via the highly selective ^{11}Be(d,p)^{12}Be transfer reaction. In order to obtain the spectroscopic factors precisely, we need the accurate optical potential for ^{11}Be elastic scattering on proton to calculate the theoretical cross section.

^{11}Be(d,p)^{12}Be transfer reaction, elastic and inelastic proton and deuteron scattering on ^{11}Be were measured in inverse kinematics at RCNP (Reacher Center for Nuclear Physics)[9] using a radioactive beam produced at 26.9*A* MeV. The elastic scattering data together with the earlier elastic scattering data were analyzed with the Chapel Hill 89 and Koning-Delaroche phenomenological optical potential. The angular distribution was found to be reproduced by reducing the real part and increasing the imaginary part of the well depth, which attributes to the coupling effects to continuum states. With normalized optical potentials of ^{10}Be elastic scattering on proton, breakup effects were analyzed using the continuum-discretized coupled-channels (CDCC) method at the four incident energies, and results shows relatively satisfying agreement. Finally, core excitation of ^{10}Be core in ^{11}Be was included by an extended version of the CDCC method (XCDCC) calculation[10], and breakup cross section is consistently reproduced. With the obtain optical potential, we report the primary results for spectroscopic factors abstracted from ^{11}Be(d,p)^{12}Be transfer reaction.

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