$^1H(^{17}Ne,P)$ 2012As04

History

Type	Author	Citation	Literature Cutoff Date
Full Evaluation	J. H. Kelley, G. C. Sheu	ENSDF	29-July-2015

The level structure of ^{18}Na was studied by ^{17}Ne+p elastic scattering, in inverse kinematics, with the aim of adding understanding to the dynamics of 2p decay of ^{19}Mg.

A beam of E(^{17}Ne)=4 MeV/nucleon ions from the SPIRAL facility at GANIL impinged on a polypropylene (C_3H_6) target assembly. The target assembly consisted of a fixed 50 μg/cm^2 C_3H_6 foil followed by a rotating (1000 rpm) C_3H_6 foil which stopped the beam and carried away the beams undesired decay radiation; scattered protons are unaffected by the target functionality.

The scattered protons, whose energies are convoluted with the target thicknesses and the scattering excitation function, were detected at $5^\circ \leq \theta_{lab} \leq 20^\circ$ with a annular position sensitive ΔE-E telescope. The scattering excitation function, which is assumed to result from elastic scattering, is deduced with an energy resolution of 13 keV. Small backgrounds from reactions on ^{12}C and β-delayed protons from ^{17}Ne are evaluated and subtracted from the proton energy spectrum. Finally the spectrum is evaluated via R-matrix analysis. Two peaks are prominent; the later apparently corresponding to a narrow $J^\pi=3^-$ resonance with interference from two broad s-wave resonances.

The deduced level structures are compared with shell-model predictions. Interpretation suggests two narrow states that are predicted in the shell model, the 1^- ground state and a 2^- excited state, are too weakly populated to be observed.

An earlier experiment utilizing a 150 μg/cm^2 C_3H_6 foil (2011As07,2011AsZX) produced similar results.

^{18}Na Levels

E(level)	J^π	Γ	Comments
0.30×10^3 *11*	2^-	5 keV *3*	%p≈100. E(level): from E_{res}=1552 keV *5* and $^{18}Na_{g.s.}$ with S_p=1.25 MeV *11*. Γ: for Γ_0 to $^{17}Ne_{g.s.}$; there is a limit of Γ<1 keV for decay to ^{17}Ne excited states.
0.59×10^3 *12*	0^-	300 keV *100*	%p≈100. E(level): from E_{res}=1842 keV *40* and $^{18}Na_{g.s.}$ with S_p=1.25 MeV *11*. Γ: for Γ_0 to $^{17}Ne_{g.s.}$; there is a limit of Γ<10 keV for decay to ^{17}Ne excited states.
0.78×10^3 *11*	1^-	900 keV *100*	%p≈100. E(level): from E_{res}=2030 keV *20* and $^{18}Na_{g.s.}$ with S_p=1.25 MeV *11*. Γ: for Γ_0 to $^{17}Ne_{g.s.}$; there is a limit of Γ<100 keV for decay to ^{17}Ne excited states.
0.83×10^3 *11*	3^-	42 keV *10*	%p≈100. E(level): from E_{res}=2084 keV *5* and $^{18}Na_{g.s.}$ with S_p=1.25 MeV *11*. Γ: for Γ_0 to $^{17}Ne_{g.s.}$; there is a limit of Γ<1 keV for decay to ^{17}Ne excited states.