Pb(^{35}Al,^{34}Alnγ) 2017Ch36,2021Bh12

Coulomb dissociation of ^{35}Al on Pb target.

2017Ch36,2014ChZZ: ^{35}Al was produced via the projectile fragmentation of a 531-MeV/nucleon ^{40}Ar primary beam from the Heavy Ion Synchrotron (SIS18) at GSI. The secondary cocktail beam was separated by the FRS separator and impinged on a 2 g/cm^2 Pb target and a 0.93 g/cm^2 C target. Projectiles and reaction fragments were detected using 8 DSSDs, separated by a large-area dipole magnet (ALADIN) and tracked using two large scintillator fiber detectors (GFIs). Neutrons from the excited projectiles were detected using the high-efficiency Large Area Neutron Detector (LAND). γ rays from the deexcited projectile and projectile-like fragments were detected using a spherical 4π Crystal Ball detector array of 162 NaI(Tl) crystals. Measured E(fragment), E_n, Eγ, Coulomb dissociation cross sections. Deduced relative populations of ^{34}Al, ^{35}Al g.s. configuration. Comparisons with shell-model calculations with the SDPF-M interaction. The measured inclusive differential CD cross section (integrated up to 5.0 MeV relative energy) for ^{35}Al->^{34}Al+n using a Pb target is 78 mb *13*.

2021Bh12: A further analysis of the data from 2017Ch36. The ^{35}Al(γ,n)^{34}Al photoabsorption cross section was obtained from fitting the direct breakup model to the measured differential Coulomb dissociation cross section of ^{35}Al breaking up into ^{34}Al core excited states. The ^{34}Al(n,γ)^{35}Al neutron capture cross sections were obtained from the photoabsorption cross sections using the detailed balance theorem.

^{35}Al Levels

E(level)	J$^\pi$	Comments
0	(5/2$^+$,3/2$^+$,1/2$^+$)	J$^\pi$: From comparisons of measured differential Coulomb dissociation cross section of ^{35}Al breaking up into ^{34}Al in its g.s. and/or 46-keV isomer with theoretical calculations from the direct breakup model using the plane-wave approximation assuming the valence neutron at different orbitals. 2017Ch36 stated that the differential CD cross section of ^{35}Al->^{34}Al+n has been interpreted in the light of a direct breakup model, and it suggests that the possible ground-state spin and parity of ^{35}Al could be, tentatively, 1/2$^+$ or 3/2$^+$ or 5/2$^+$. Major configurations and spectroscopic factor for J^π=5/2$^+$ of ^{35}Al g.s.: (g.s., 4$^-$ in ^{34}Al)$\otimes\nu p_{3/2}$, S=0.36 *9* (2017Ch36); (46 keV, 1$^+$ in ^{34}Al)$\otimes\nu d_{3/2}$, S=1.47 *22* (2017Ch36); (1.4 MeV, 2$^+$ in ^{34}Al)$\otimes\nu s_{1/2}$, S=0.16 *1* (2021Bh12); (2.5 MeV, 3$^-$ in ^{34}Al)$\otimes\nu p_{3/2}$, S=1.48 *18* (2021Bh12). Other configurations for J^π=1/2$^+$,3/2$^+$ of ^{35}Al g.s.: (g.s., 4$^-$ in ^{34}Al)$\otimes\nu f_{7/2}$, S=1.03 *43* and (46 keV, 1$^+$ in ^{34}Al)$\otimes\nu s_{1/2}$, S=0.62 *7*; (46 keV, 1$^+$ in ^{34}Al)$\otimes\nu s_{1/2}$, S=0.72 *8*; (46 keV, 1$^+$ in ^{34}Al)$\otimes\nu s_{1/2}$, S=0.45 *7* and (46 keV,1$^+$ in ^{34}Al)$\otimes\nu d_{5/2}$, S=0.94 *22*.