

**Pb( $^{35}\text{Al}, ^{34}\text{Al}n\gamma$ )    2017Ch36,2021Bh12**

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

**2017Ch36,2014ChZZ:**  $^{35}\text{Al}$  was produced via the projectile fragmentation of a 531-MeV/nucleon  $^{40}\text{Ar}$  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<sup>2</sup> Pb target and a 0.93 g/cm<sup>2</sup> 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).  $\gamma$  rays from the deexcited projectile and projectile-like fragments were detected using a spherical 4 $\pi$  Crystal Ball detector array of 162 NaI(Tl) crystals. Measured  $E(\text{fragment})$ ,  $E_n$ ,  $E_\gamma$ , Coulomb dissociation cross sections. Deduced relative populations of  $^{34}\text{Al}$ ,  $^{35}\text{Al}$  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  $^{35}\text{Al} \rightarrow ^{34}\text{Al}+n$  using a Pb target is 78 mb *13*.

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

 **$^{35}\text{Al}$  Levels**

<u>E(level)</u>	<u><math>J^\pi</math></u>	<u>Comments</u>
0	(5/2 <sup>+</sup> , 3/2 <sup>+</sup> , 1/2 <sup>+</sup> )	<p><math>J^\pi</math>: From comparisons of measured differential Coulomb dissociation cross section of <math>^{35}\text{Al}</math> breaking up into <math>^{34}\text{Al}</math> 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. <b>2017Ch36</b> stated that the differential CD cross section of <math>^{35}\text{Al} \rightarrow ^{34}\text{Al}+n</math> has been interpreted in the light of a direct breakup model, and it suggests that the possible ground-state spin and parity of <math>^{35}\text{Al}</math> could be, tentatively, 1/2<sup>+</sup> or 3/2<sup>+</sup> or 5/2<sup>+</sup>.</p> <p>Major configurations and spectroscopic factor for <math>J^\pi=5/2^+</math> of <math>^{35}\text{Al}</math> g.s.: (g.s., 4<sup>-</sup> in <math>^{34}\text{Al}</math>)<math>\otimes</math><math>\nu p_{3/2}</math>, <math>S=0.36</math> 9 (<b>2017Ch36</b>); (46 keV, 1<sup>+</sup> in <math>^{34}\text{Al}</math>)<math>\otimes</math><math>\nu d_{3/2}</math>, <math>S=1.47</math> 22 (<b>2017Ch36</b>); (1.4 MeV, 2<sup>+</sup> in <math>^{34}\text{Al}</math>)<math>\otimes</math><math>\nu s_{1/2}</math>, <math>S=0.16</math> 1 (<b>2021Bh12</b>); (2.5 MeV, 3<sup>-</sup> in <math>^{34}\text{Al}</math>)<math>\otimes</math><math>\nu p_{3/2}</math>, <math>S=1.48</math> 18 (<b>2021Bh12</b>).</p> <p>Other configurations for <math>J^\pi=1/2^+, 3/2^+</math> of <math>^{35}\text{Al}</math> g.s.: (g.s., 4<sup>-</sup> in <math>^{34}\text{Al}</math>)<math>\otimes</math><math>\nu f_{7/2}</math>, <math>S=1.03</math> 43 and (46 keV, 1<sup>+</sup> in <math>^{34}\text{Al}</math>)<math>\otimes</math><math>\nu s_{1/2}</math>, <math>S=0.62</math> 7; (46 keV, 1<sup>+</sup> in <math>^{34}\text{Al}</math>)<math>\otimes</math><math>\nu s_{1/2}</math>, <math>S=0.72</math> 8; (46 keV, 1<sup>+</sup> in <math>^{34}\text{Al}</math>)<math>\otimes</math><math>\nu s_{1/2}</math>, <math>S=0.45</math> 7 and (46 keV, 1<sup>+</sup> in <math>^{34}\text{Al}</math>)<math>\otimes</math><math>\nu d_{5/2}</math>, <math>S=0.94</math> 22.</p>