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Neutron spectroscopy of γ-AlH_3 ALEXANDER KOLESNIKOV, Oak Ridge National Laboratory, Oak Ridge, TN 37831, JASON GRAETZ, Brookhaven National Laboratory, Upton, NY 11973, CRAIG JENSEN, WALKER LANGLEY, University of Hawaii, Honolulu, HI 96822, VLADIMIR ANTONOV, Inst. Solid State Physics, RAS, Chernogolovka, Russia — The density of vibrational states, G(E), for γ-AlH_3 is measured by inelastic neutron scattering. The obtained spectrum noticeably differs from that of α-AlH_3, because α-AlH_3 has a structure built of corner-sharing AlH_6 octahedra, while the γ-AlH_3 is composed of both corner- and edge-sharing AlH_6 octahedra. The first acoustic phonon peak in the G(E) of γ-AlH_3 appears at a lower energy and the band of translational modes extends to higher energies (55 vs. 42 meV) than in the spectrum of α-AlH_3. The bands of Al-H bending modes are observed at about the same energies of 60–140 meV in γ-AlH_3 and α-AlH_3, only the structures of the bands are different. The Al-H stretching modes in the γ-phase show eight peaks in the range 145 to 265 meV, while in the α-phase they exhibits only two peaks at 200 and 235 meV. The G(E) spectrum of γ-AlH_3 is in good agreement with recent simulations [Y. Wang *et al., Phys. Rev. B* **77** (2008) 014101], which took into account the existence of a unique double-bridge bond between certain Al and H atoms.

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