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Authors
Conway, John G.
Mclaughlin, Ralph D.

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NUCLEAR SPIN AM^{243} AND ISOTOPE SHIFT IN THE AMERICIUM SPECTRUM

John G. Conway, Ralph D. McLaughlin

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Nuclear Spin of Am^{243} and Isotope Shift in the Americium Spectrum

John G. Conway and Ralph D. McLaughlin
Radiation Laboratory
University of California, Berkeley, California

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Recent advances in nuclear chemistry have made it possible to obtain relatively large amounts of Am^{243}. The quantities available are of such size as to make the determination of nuclear spin feasible by spectroscopic methods. Two 30 microgram samples of americium were recently obtained for this purpose. One contained roughly 10 percent Am^{243} and 90 percent Am^{241}, and the other contained roughly 80 percent Am^{243} and 20 percent Am^{241}.

The samples, which were received in an aqueous solution, were evaporated to dryness upon graphite electrodes which were 0.25 inch in diameter. The sample excitation was performed by a direct current arc which was regulated to pass 15 amperes of current. The spectrum was recorded in the second and third orders of a 21-foot, 30,000 line per inch grating in a Paschen-Runge mount. An iron spectrum and an Am^{241} spectrum were photographed for comparison.

Fred and Tomkins[1] have reported the hyperfine structure of Am^{241} to be a flag pattern of six components with a spin of 5/2. No differences were observed in the hyperfine structure of Am^{243} and Am^{241}. Both structures form a flag pattern of six lines. Since Am^{243} shows six hyperfine components, it must have a nuclear spin of 5/2. There is no reason to doubt the validity of the assumption that J is greater than I. Within 2 percent error the patterns of Am^{243} and Am^{241} have the same overall width. This indicates that the nuclear magnetic moment must be equal in the two isotopes.

The isotope shift between Am^{243} and Am^{241} was also observed. Table 1 contains the wavelengths of the first component of the pattern of the hyperfine lines for Am^{243} and the shift between Am^{243} and Am^{241} of that component.

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1. M. Fred and F. S. Tomkins, Phys. Rev. 89, 318 (1953).

Table 1

Isotope Shifts in the Americium Spectrum

Wavelengths of the First Component in the Flag Pattern of Am^{243}

λ_{243}	$\Delta\lambda_{243-241}$
2815.17	+0.022 A
2888.46	-0.017
2909.72	+0.014
2911.06	-0.009
2938.96	+0.069
2957.13 a	-0.009
2958.29	+0.007
2969.21	+0.014
2993.38	+0.014
3027.91	+0.021
3161.19 a	-0.025
3204.05	+0.020
3225.27	+0.040
3257.93	-0.007
3258.62	-0.080
3282.48 a	-0.024
3262.67 a	-0.020
3451.99	+0.014
3473.16	+0.014
3496.48	+0.007
3926.07	+0.013
4372.35	+0.058
4441.43 a	+0.026
4509.16	+0.032
4680.84 a	+0.012
4699.46	+0.031
4786.64	+0.071
4871.93	+0.032

a lines in which the first component is on the higher wavelength side of the pattern.