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Magnetic Moment of the 3/2+ State in 165Ho

Abstract

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oral

Summary

Electromagnetic moments of nuclei are important physical quantities not only for nuclear structure studies, but also for investigation of the electromagnetic structures in materials. Reliable values of electromagnetic moments of radioactive nuclei are essential especially for probe nuclei of rare-earth elements in ferromagnetic materials through hyperfine interactions since it is difficult to apply the conventional NMR technique due to their very high resonance frequencies and shallow skin depths. One such example is Ho in Fe, which, as Torumba et al. have pointed out, is important for evaluating first principle calculations [1].
This time, we succeeded in observing the Larmor precession for the 362 keV state in 165Ho(Iπ = 3/2+, T1/2 = 1.512 μs) in Dy2O3 by use of the perturbed angular correlation technique, intending to determine the magnetic moment and apply it to the measurement of the hyperfine field at Ho in Fe.
The 362 keV state in 165Ho was populated as a decay product of 165Dy, which in turn was produced by the neutron activation of 164Dy in natural Dy2O3 power. A static external magnetic field of 3 kG was applied to the sample at room temperature. The Larmor frequency for the 362 keV state in 165Ho in Dy2O3 was determined to be −32.3 ± 0.6 MHz. The magnetic moment for this state was tentatively deduced to be +2˜3 μN under the assumption that the paramagnetic correction factor for free Ho+3 ions [2] is applicable to the present case. Taking the uncertainty of the paramagnetic correction factor in Dy2O3 into account, the deduced magnetic moment would be consistent with a simple model calculation of the magnetic moment for rotational state nuclei. An accurate evaluation of the paramagnetic correction factor for Ho in Dy2O3 is now in progress to finalize the magnetic moment value.

References

[1] D. Torumba, V. Vanhoof, M. Rots, and S. Cottenier, Phys. Rev. B 74 (2006) 014409.

[2] C. Günther and I. Lindgren, in Perturbed Angular Correlations, eds. E. Karlsson, E. Matthias, and K. Siegbahn (North-Holland, Amsterdam, 1964) p. 355.

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