Dynamic Behavior of Group 13 Elements in Bromocomplexes as Studied by NQR and NMR

Yasumasa Tomita, Hiroshi Ohki, Koji Yamada, and Tsutomu Okuda
Department of Chemistry, Graduate School of Science, Hiroshima University, Kagamiyama, Higashi-Hiroshima 739-8526, Japan
Reprint requests to Prof. T. O.; E-mail: tokuda@sci.hiroshima-u.ac.jp


NMR, NQR, powder X-ray diffraction, DTA and AC conductivity were measured in RMB₄ (R = Ag, Cu; M = Al, Ga) and RM₂Br₇ (R = Li, Ag; M = Al, Ga). In RMB₄, the activation energy of Cu⁺ diffusion was evaluated from ⁶³Cu NMR and was in good agreement with that from ⁸¹Br NQR. In CuAlBr₄, the e²Qq/h value of ⁶³Cu NMR and the η value of ²⁷Al NMR changed linearly with decreasing temperature, although the e²Qq/h value of ²⁷Al NMR did not change so much. These temperature dependences are supposed to be due to Cu⁺ diffusion and not to a variation of the lattice constants. In RM₂Br₇, the activation energy was obtained from the spin-lattice relaxation time T₁ of ⁸¹Br NQR and is ascribed to a modulation of the cation diffusion. The line width of ⁷Li NMR in LiAl₂Br₇ was about 5.9 kHz in the low-temperature phase and 0.4 kHz for the high-temperature phase. The ²⁷Al NMR spectrum was broadened by the quadrupole interaction and unchanged up to 400 K, suggesting that diffusion of Li⁺ ions occurs in the high-temperature phase.

Key words: T₁ of ⁸¹Br NQR; ²⁷Al NMR; ⁷Li NMR; ⁶³Cu NMR; Cation Diffusion.