VIII-G The Effects of the 2D Spin-Echo NMR Experiment on a Solid-State Homonuclear Spin-1/2 Pair

The 2D spin-echo NMR experiment can reintroduce the influence of homonuclear dipolar interactions average out by magic-angle sample spinning (MAS).

VIII-G-1 Novel Structure Discovered on Two-Dimensional Spin-Echo NMR Spectra for a Homonuclear Spin-1/2 Pair in Rotating Solids

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Two-dimensional (2D) spin-echo NMR experiments have been carried out on polycrystalline [2,3-$^{13}C_2$]-*L*-alanine under magic-angle sample spinning (MAS) conditions, so that two unusual resonance lines emerged along the F_1 axis. Theoretically it was found that the line positions were determined by the sample spinning frequency and the isotropic chemical-shift difference (*Chem. Phys. Lett.* **305**, 35 (1999)). Stimulated by the result, we carried out the 2D NMR experiment using a sufficiently small t_1 increment in order to enlarge the spectral width of the F_1 domain. As a result, we found many more resonance lines on a spectrum sliced along the F_1 axis. The line distribution had a very unique and interesting structure. To elucidate the line positions theoretically, the signal for the 2D spin-echo experiment performed with any t_1 increment was calculated analytically for a homonuclear two-spin-1/2 system undergoing MAS. We showed that virtually six resonance lines (exactly twelve resonance lines) occurred on a spectrum sliced along the F_1 axis. In addition, it was demonstrated that the intensities of some resonance lines were largely dependent on the dipolar interaction. The 2D spin-echo experiment for a solid-state homonuclear two-spin system was found to have the capability of extracting information concerning the dipolar tensor under MAS conditions.

VIII-H Rotational Echo Double Resonance (REDOR) Experiments with Overtone Adiabatic Inversion Pulses

The effect of overtone adiabatic inversion pulse on solid-state ^{14}N spins was investigated.

VIII-H-1 The Observation of REDOR Phenomenon for Solid-State ^{13}C-^{14}N spin Systems with the Help of Overtone Adiabatic Inversion Pulses

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We applied overtone adiabatic inversion pulses to ^{13}C-^{14}N spin systems in powdered *L*-alanine undergoing MAS in order to observe REDOR phenomenon. The damping of ^{13}C resonance line intensities was compared with that corresponding to the REDOR experiments with normal RF pulses having a constant frequency. We tried to establish the theoretical treatment for the REDOR experiments with adiabatic inversion pulses.