

Observation of forbidden transitions in Mn (III) porphyrin complexes

Product used : Electron Spin Resonance (ESR)

The dual mode cavity (ES-14040DMC) can be used in combination with a variable temperature controller, allowing ESR observations at various temperatures. In this issue, we will introduce a cryogenic measurement combined with a liquid helium variable temperature system (ES-CT470). Please refer to application note ER210003E for details on the dual mode cavity.

■ Example of ESR measurement

ESR spectra of Mn (III) porphyrin complexes (Figure 1) were observed at cryogenic temperatures (5 K). Mn (III) ($S = 2, I = 5/2$) has a $3d^4$ electron configuration. Very few ESR papers have been reported on d^4 ions because they have short spin-lattice relaxation time and large zero-field splitting. Mn (III) was measured at 5K in order to extend the spin-lattice relaxation time as much as possible. While no clear signal was observed in the perpendicular mode (Figure 2(A)), a forbidden transition with six hyperfine splitting by Mn was observed at $g = 8.2$ in the parallel mode (Figure 2(B)).

Observation of forbidden transitions using the parallel mode may provide clues for investigating the molecular structure and the electronic state of the paramagnetic species that could not be examined so far.

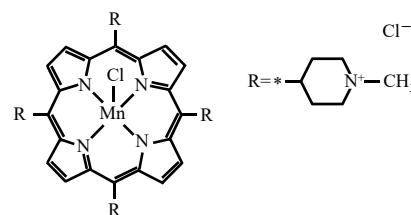


Figure 1. Mn (III) porphyrin complexes

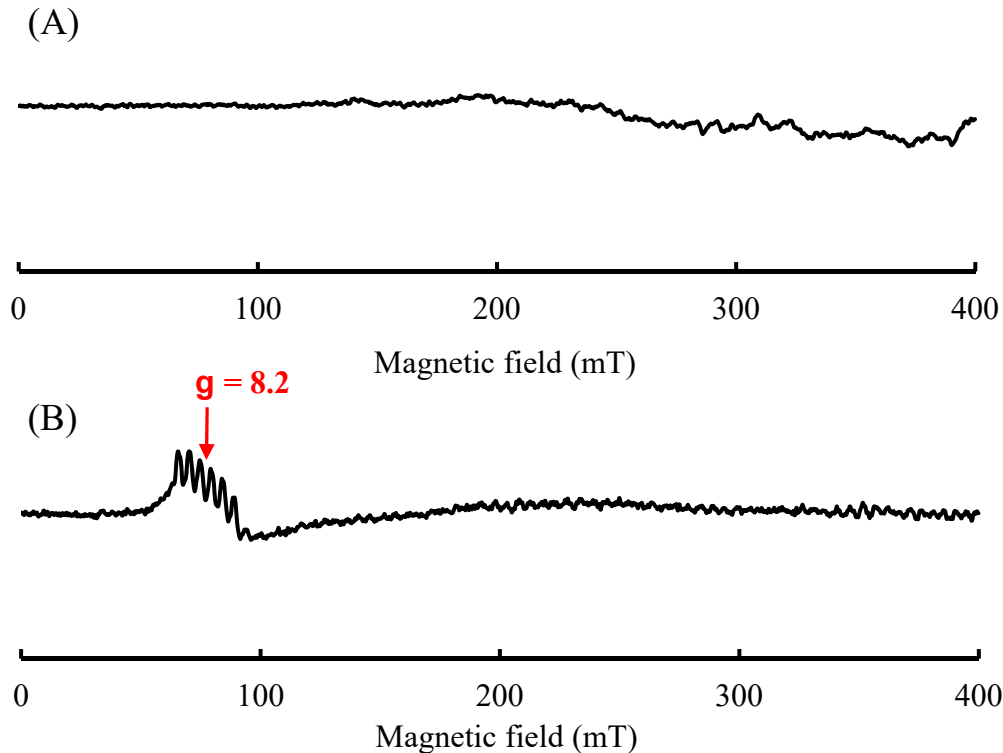


Figure 2. ESR spectra of Mn (III) porphyrin complexes in perpendicular and parallel modes.
(A) Perpendicular mode (Frequency: 9332 MHz) (B) Parallel mode (Frequency: 8793 MHz)

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