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This document contains the IR spectra of complexes 1-5

Details of the fitting procedures for the $\chi T = f(T)$ magnetic data

CCDC 912356 - 912360 contain the supplementary crystallographic data for this paper that can be obtained free of charge from the Cambridge Crystallographic Data Centre via www.ccdc.cam.ac.uk/data_request/cif

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[NiCl$_2$(HL)$_2$] (1)
[\text{Ni(μ-Cl)(HL}_{\text{Et})}_{\text{2}}\text{Cl}_{\text{2}}\text{ (2)}]
$[\text{Ni}(\mu_3-\text{Cl})(\text{Cl})(\text{HL})]_4$ (3)
$[\text{Ni(µ}_3\text{Cl})(\text{Cl})(\text{HL}_{\text{Et}})]_4$ (4)
[NiCl(μ₃-OH)(HL)]₄ (5)
Magnetic data.

The fitting procedure for the $\chi T = f(T)$ data is rather classical (see O. Kahn, *Molecular Magnetism*, Wiley-VCH, 1993). First, the eigen values of the spin Hamiltonian corresponding to the spin topology defined are calculated and then introduced in the van Vleck equation. This affords a $\chi T = f(T, J, g)$ relationship. This parameterized equation is introduced into a minimization procedure and, after a fit using the least squares method, the best parameters to reproduce experimental data are obtained. The axial zero field splitting parameter ($D$) is introduced only on the ground state ($S = 4$) and intermolecular interactions ($zJ$) are introduced via the mean field approach.