# 物理科学談話会

## Neutron diffraction in new multiferroic molecular magnets

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# Neutron diffraction in new multiferroic molecular magnets

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The family of antiferromagnetic $A_2[FeCl_5(H_2O)]$ compounds ($A$ = alkali metal or ammonium ion) has awakened a renewed interest owing to the recent observation of multiferroicity in some of its members.[i,ii] We have recently investigated by means of single crystal and powder neutron diffraction the magnetic structure of $(ND_4)_2[FeCl_5(D_2O)]$ (with properties completely equivalent to the hydrogenated form) in order to understand the underlying mechanism of multiferroicity in this compound. This material orders antiferromagnetically at $T_N$ = 7.25 K and multiferroicity arises below *ca.* 6.9 K with the onset of ferroelectric order. We have observed at zero magnetic field a cycloidal magnetic structure propagating in the *c*-axis with **k** = (0, 0, 0.23) and with the magnetic moments lying in the *ac* plane (Fig.1). This cycloid would be at the origin of the magneto-electric coupling via inverse Dzyaloshinsky–Moriya interaction[iii].

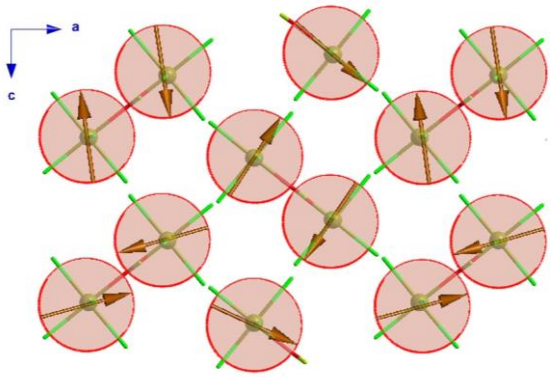


**Figure 1:** View along the *b*-axis of the superposition of the nuclear and magnetic structures of $(ND_4)_2[FeCl_5(D_2O)]$. For the sake of clarity only $[FeCl_5(D_2O)]$ units have been represented.

[i] Ackermann M, Brüning D, Lorenz T, Becker P and Bohatý L **2013** New J. Phys. *15* 123001
[ii] Ackermann M, Lorenz T, Becker P and Bohatý L **2014** ArXiv :1408.3997v1
[iii] Velamazán et al. Scientific Reports | 5:14475 | DOI: 10.1038/srep14475