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Pedersen, Kasper Steen; Clerac, Rodolphe; Barra, Anne-Laure; Sibille, Romain; Probert, Michael; Meihaus, Katie; Dechambenoit, Pierre; Sørensen, Mikkel Agerbæk; Sigrist, Marc; Weyhermüller, Thomas; Weihe, Høgni; Piligkos, Stergios; Tressaud, Alain; Mutka, Hannu; Bill, Eckhard; Long, Jeffrey R.; Bendix, Jesper

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Kasper S. Pedersen, Rodolphe Clérac, Anne-Laure Barra, Romain Sibille, Michael Probert, Katie Meihaus, Pierre Dechambenoit, Mikael A. Sørensen, Marc Sigrist, Thomas Weyhermüller, Hogni Weife, Stergios Piligkos, Alain Tressaud, Hannu Mutka, Eckhard Bill, Jeffrey R. Long, Jesper Bendix

E-mail: ksp@kiku.dk

Introduction
Diffuse orbitals and large magnetic anisotropies resulting from strong spin-orbit coupling make complexes with central ions from the 4d and 5d series interesting modules for magnetic materials. The preponderance of homo- and heteroleptic cyanide complexes has been hard to challenge and only few exceptions have been reported. Although homoleptic fluoride complexes are well-described in the literature, they have, with a sole exception, not been employed as modules for molecular magnetic materials. This scarcity of hexafluorido-metallate-based magnetic materials may be due to the harsh synthetic conditions often required for the formation of fluorometallates and to their common inherent lability, outside hydrofluoric acid solutions, towards e.g. hydrolysis. The combination of the apparent kinetic inertness and the potential strong magnetic anisotropy of 5d systems, led us to explore MF$_6$ as possible modules for molecule-based magnetic materials.

Hexafiuorometallate modules

Dynamic properties of axially distorted MF$_6$²⁻

Example: Long-range order in the Fe$^{II}$-Re$^{IV}$ chain

Conclusions:
We presented the use of the simple 5d homoleptic fluoride complexes as modules for magnetic systems. This is exemplified by the chemically robust MF$_6$ as possible modules for molecule-based magnetic materials.