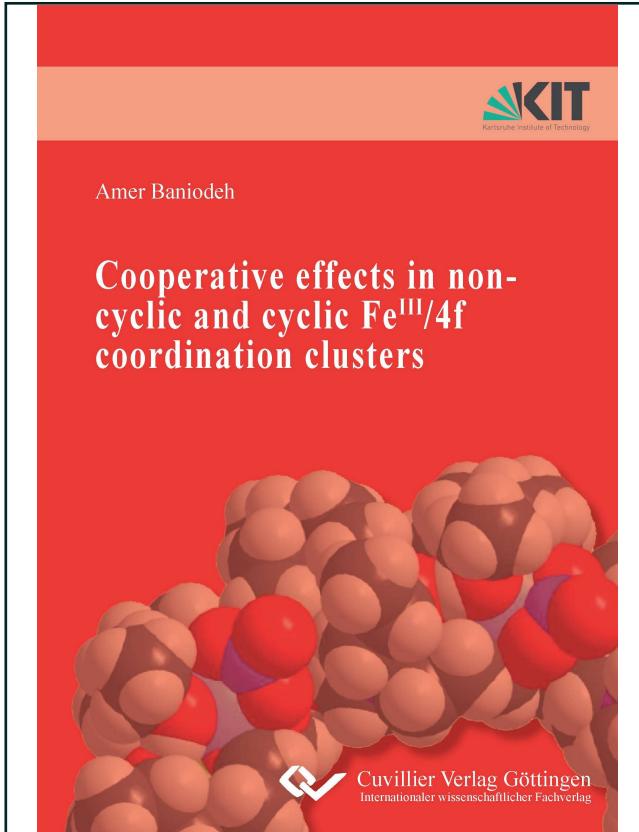




Amer Baniodeh (Autor)

## **Cooperative effects in non-cyclic and cyclic Fe<sup>III</sup>/4f coordination clusters**



<https://cuvillier.de/de/shop/publications/6428>

Copyright:

Cuvillier Verlag, Inhaberin Annette Jentzsch-Cuvillier, Nonnenstieg 8, 37075 Göttingen, Germany

Telefon: +49 (0)551 54724-0, E-Mail: [info@cuvillier.de](mailto:info@cuvillier.de), Website: <https://cuvillier.de>



# Contents

## Chapter 1: Introduction

### 1.1 Motivation (p. 1-4)

*Research Philosophy*

*General Scope*

*Subjec*

### 1.2 Molecular Magnetism (p. 4-15)

*History and Basics*

*Magnetic Anisotropy*

*Quantum Tunneling of Magnetization*

*Methods of Measuring*

*Single Molecule Magnets*

*Theoretical Reflection*

*Magnetic Properties of oxo- Fe<sup>III</sup>*

*Magnetic Properties of Ln<sup>III</sup>*

*Fe<sup>III</sup>/4f Chemistry*

### 1.3 Magneto Caloric Effect (p. 15-17)

### 1.4 Mössbauer Spectroscopy (p. 17-21)

*The Effect*

*The Outputs*

*The Spectrum*



**1.5 Electron Paramagnetic Resonance Spectroscopy** (p. 21-22)

**1.6 Femtosecond Spectroscopy** (p. 22-24)

*Femtosecond Chemistry*

*Pump-Probe Technique*

*The Use*

**1.7 Thesis Overview** (p. 24-26)

## Chapter 2: A Comparative Study of a Tetranuclear $\{Fe_2Ln_2\}$ Family

**2.1 Introduction** (p. 26-31)

**2.2 Syntheses and Structures** (p. 31-49)

*The Trinuclear Starting Materials*

*The Mechanism of  $\{Fe_2Ln_2\}$*

*The  $\{Fe_8\}$  Problem*

*The “Test-Bed” System*

*The Para-  $\{Fe_2Ln_2\}$  Examples*

*The Meta- and Ortho-Examples*

*Examples with only Four Carboxylates*

*Examples with disubstituents*

*Rich Aromatic and non-Aromatic Examples*

*Other Tetranuclear Clusters with related Ligands*

*Crystallographic Data Comparison*

*The Solid Solutions*

*The Dinuclear and Mono-nuclear Reference Compounds*

*New “Test-Bed” Systems*



## 2.3 Magnetic Properties (p. 50-77)

*The  $\{Fe_2Ln_2\}$  Reference Series*

*The Para- $\{Fe_2Dy_2\}$  Examples*

*Comparison with Meta-Examples*

*Summary*

*The Solid Solutions Series*

*The  $Fe_6Dy_2$  Compound*

## 2.4 Mössbauer Study (p. 77-99)

*The  $\{Fe_2Ln_2\}$  Reference Series*

*The Para- $\{Fe_2Dy_2\}$  Examples*

*Comparison with Meta-Examples*

*Effects: Inductive, Hammet, Dipole Moment...etc*

*Other  $\{Fe_2Dy_2\}$  Examples*

*Solid Solution Compounds*

*The  $Fe_6Dy_2$  Compound*

## 2.5 Theoretical Calculations (p. 100-111)

*The  $\{Fe_2Ln_2\}$  Reference Series*

*Calculations on the Substituents*

*General Interpretations*

*The  $Fe_6Dy_2$  Compound*

## 2.6 EPR Spectroscopy (p. 111-116)

*The  $\{Fe_2Ln_2\}$  Reference Series*

*Para versus Meta*



## The Solid Solutions

### 2.7 Conclusion

(p. 116-117)

## Chapter 3: Cyclic Fe<sup>III</sup>/Ln<sup>III</sup> Coordination Clusters

### 3.1 Introduction

(p. 118-120)

### 3.2 Syntheses and Structures

(p. 120-137)

*The {Fe<sub>5</sub>Ln<sub>3</sub>} , {Fe<sub>4</sub>Ln<sub>2</sub>} , {Fe<sub>3</sub>Ln<sub>2</sub>} Rings and the {Ln<sub>2</sub>} Dimers*

*The {Fe<sub>16</sub>Ln<sub>4</sub>} Loops*

*The {Fe<sub>18</sub>Dy<sub>6</sub>} Wheel*

*The {Fe<sub>4</sub>Dy<sub>4</sub>} Ring*

*The {Dy<sub>6</sub>} Rings*

### 3.3 Magnetic Properties

(p. 137-159)

*The {Fe<sub>5</sub>Ln<sub>3</sub>} Series*

*Theoretical Consideration*

*The {Fe<sub>4</sub>Ln<sub>2</sub>} Series*

*The {Fe<sub>3</sub>Ln<sub>2</sub>} Series*

*The {Fe<sub>16</sub>Ln<sub>4</sub>} Series*

*The {Fe<sub>4</sub>Dy<sub>4</sub>} Compound*

*The {Dy<sub>6</sub>} Systems*

### 3.4 Mössbauer Study

(p. 159-177)

*The {Fe<sub>5</sub>Ln<sub>3</sub>} Series*

*The {Fe<sub>4</sub>Ln<sub>2</sub>} Series*

*The {Fe<sub>3</sub>Ln<sub>2</sub>} Series*



*The  $\{Fe_{16}Ln_4\}$  Series*

*The  $\{Fe_4Dy_4\}$  Compound*

**3.5 Conclusion** (p. 177-178)

## **Chapter 4: $\{Fe_{10}Ln_{10}\}$ Cooperative Coordination Clusters**

**4.1 Introduction** (p. 179-185)

**4.2 Syntheses and Structures** (p. 185-194)

*$\{Fe_{10}Ln_{10}\}$  Series*

*Reference Compounds*

*Other Compounds*

**4.3 Magnetic Properties** (p. 194-204)

**4.4 Magneto Caloric Effect** (p. 204-206)

**4.5 Mössbauer Study** (p. 206-209)

**4.6 Optical Study** (p. 209-234)

*Steady-State Absorption Spectroscopy*

*Femtosecond Transient Spectroscopy*

*Photolysis Experiments*

*Qualitative Experiments*

*The Blue-Violett Material*

*Behaviour in Water*

*Other Measurements*

**4.7 Conclusion** (p. 234-235)



**Chapter 5: Summary and Outlook** (p. 236-239)

**Chapter 6: Experimental**

**6.1 Characterization Methods for Compounds and Properties** (p. 240-245)

**6.2 Compounds Preparation** (p. 245-271)

**Chapter 7: Literature Sources** (p. 272-283)

**Chapter 8: Appendix** (p. 284-358)