

Temperature-Induced Metamagnetic Transition and Domain Structures of Single-Crystalline FeRh Thin Films on MgO(100)

Xianzhong Zhou

Forschungszentrum Jülich GmbH
Peter Grünberg Institute (PGI)
Peter Grünberg Institute (PGI-6)

Temperature-Induced Metamagnetic Transition and Domain Structures of Single-Crystalline FeRh Thin Films on MgO(100)

Xianzhong Zhou

Schriften des Forschungszentrums Jülich
Reihe Schlüsseltechnologien / Key Technologies

Band / Volume 76

ISSN 1866-1807

ISBN 978-3-89336-919-5

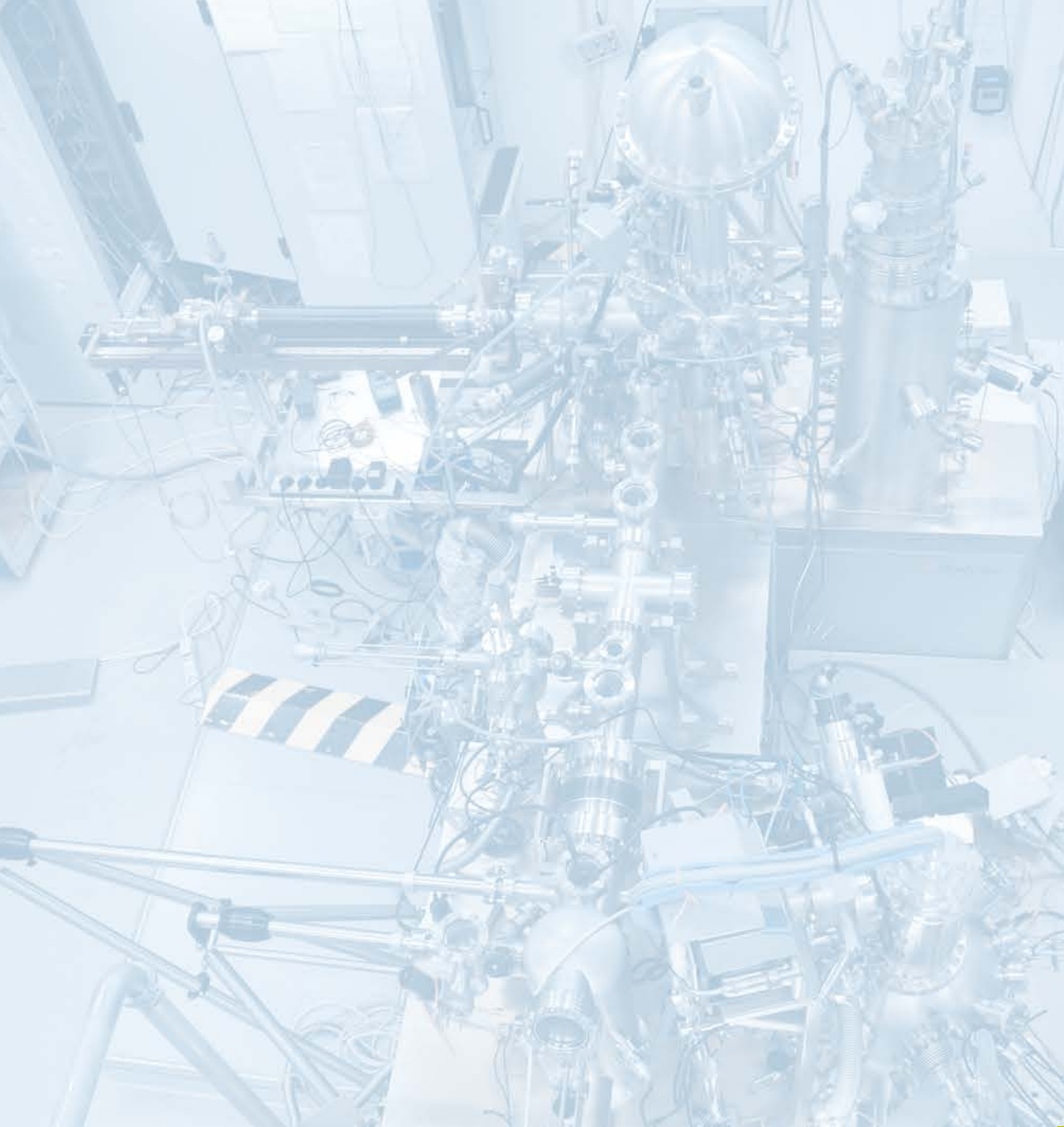
Contents

1. Introduction	1
2. Fundamentals	5
2.1. Magnetic moments of FeRh	5
2.2. Mean field approximation of Ising model for FeRh	8
2.2.1. Ising model of FeRh	9
2.2.2. First-order magnetic transition for the Ising model of FeRh	15
2.3. Magnetic domain theory	21
2.3.1. Magnetic energy terms	22
2.3.2. Magnetic domain structure	23
3. Experimental procedures	25
3.1. Experimental setups	25
3.2. Sample preparation methods	30
3.2.1. Thermal evaporation	30
3.2.2. Low-energy electron diffraction	32
3.2.3. X-ray photoelectron spectroscopy	33
3.2.4. Auger electron spectroscopy	35
3.3. In-situ magneto-optical Kerr effect	36
3.4. Scanning electron microscopy with polarization analysis	39
3.4.1. Scanning electron microscopy	39
3.4.2. Spin-polarized low-energy electron diffraction	40
3.4.3. Calibration of the four MCPs	43
4. Results	47
4.1. Ex-situ preparation method	47
4.1.1. Ex-situ sample preparation	47
4.1.2. Magnetic properties of ex-situ prepared FeRh films	57
4.2. In-situ preparation method	65
4.2.1. In-situ sample preparation	65
4.2.2. Magnetic properties of in-situ prepared FeRh films	71
5. Summary and conclusion	79
A. Mean field approximation of Ising model	83
B. Spin-1 Ising model with zero-field splitting	87

Contents

Bibliography

97



Schlüsseltechnologien / Key Technologies
Band / Volume 76
ISBN 978-3-89336-919-5

 **JÜLICH**
FORSCHUNGSZENTRUM