

Contents

1. Introduction.....	7
2. Theoretical foundations	10
2.1. Motivation	10
2.2. History of storage media	11
2.3. Ideas for future magnetic storage media	19
2.4. Technical interest in systems with novel anisotropies for data storage media	21
3. Experimental results	23
3.1. MOKE setup.....	23
3.2. Other methods to measure magnetization.....	25
3.3. Preparation of magnetic samples with textile methods.....	26
3.4. MOKE experiments on thin layer samples (Co/CoO)	30
3.5. Comparison with results of Magpar simulations	32
3.6. Comparison with results of MathCad simulations.....	34
3.7. MOKE experiments on nano-cylinders.....	38
3.8. MOKE experiments on textile-based samples with uneven surface..	38
4. Simulations with Magpar.....	40
4.1. MagPar – a short overview of the program.....	40
4.2. Low-dimensional half-ball systems with shape modifications.....	41
4.2.a. Hysteresis loops	42
4.2.b. Reversal dynamics	50
4.2.c. Vortex core precession and M rotation	54
4.2.d. Influence of the Gilbert damping constant α	57
4.2.e. Influence of the field sweeping speed.....	58
4.2.f. Magnetization reversal mechanisms in M_x - M_y -graphs	61
4.2.g. Shape dependence of magnetization reversal	63
4.3. 4-fold wire systems	73
4.3.a. Hysteresis loops with intermediate states	74
4.3.b. Angular dependence of the coercive fields – 2x2 wires	78
4.3.c. Influence of dimensions on magnetization reversal processes	86
4.3.d. Magnetization reversal mechanisms in M_x - M_y -graphs	92
4.3.e. Influence of wire connections	93
4.3.f. Special corner solutions.....	95
4.3.g. Magnetization reversal in fourfold Co wire system	98
4.4. 2-fold wire systems	102
4.4.a. Angular dependence of the coercive fields – parallel wires	102
4.4.b. Comparison with wire sample with extended ends	112
4.5. 3-fold wire system.....	116
4.6. 6-fold wire system.....	119
5. Outlook	124
5.1. Systems with novel anisotropies	124

5.2. Proposals for technological solution	130
6. Conclusion	135
Literature	138
Appendix I: Anisotropies and internal magnetic fields in FM systems	155
Appendix II: Description of MathCad program used in this thesis	159
Appendix III: Comparison of theoretical and experimental results	163