Contents

1. Introduction 1

2. Phenomenologic Theory of Magnetism and Classification of Magnetic Solitons 4
- 2.1 Magnetization. Landau–Lifshitz Equations. 4
- 2.2 Magnetic Properties of Weak Ferromagnets 7
- 2.3 Domain Walls 13
- 2.4 Bloch Lines and Points 16
- 2.5 Effective Equations of the Dynamics of WFM Magnetization 21

3. Experimental Methods of Investigation of the Domain Wall Dynamics in Ferromagnets 28
- 3.1 The Faraday Effect in Orthoferrites, Garnets and Iron Borate 28
- 3.2 Magnetooptical Observation of Domains and Domain Walls in Ferromagnets 35
- 3.3 The Sixtus–Tonks Method 37
- 3.4 Method of the Bubble Domain Collapse 38
- 3.5 Magnetooptical Method of Recording the Domain Wall Transit Time 38
- 3.6 Method of High–Speed Photography 40
- 3.7 Method of Double High–Speed Photography 42
- 3.8 Optical Doppler Effect from the Moving Domain Wall 44

4. Main Features of Stimulated Motion of Domain Walls 47
- 4.1 Mobility of a Domain Wall 47
- 4.2 Magnetoelastic Anomalies in the Dynamics of Domain Walls in Orthoferrites 50
- 4.3 Dynamics of Domain Walls in Iron Borate 53
- 4.4 Limiting Velocity 55
- 4.5 Elementary Theoretical Analysis 59

5. Magnetoelastic Interaction and Dynamics of Domain Walls 64
5.1 Magnetoelastic Interaction and Cherenkov Emission of Phonons 65
5.2 Simplest Theory of Magnetoelastic Gap 75
5.3 Shock Wave Excitation under the DW Motion 80
5.4 DW Retardation due to Shock Wave Excitation 85

6. Stability and Probabilistic Description of DW Motion . 87

7. Microscopic Theory of Relaxation of Domain Walls ... 96
7.1 General Considerations 96
7.2 Intrinsic Relaxations 98
7.3 Impurity Relaxation in Orthoferrites with Rare–Earth Ions 110

8. Non–one–Dimensional Dynamics of Domain Walls in Weak Ferromagnets 113
8.1 Non–one–Dimensionality of Supersonic Dynamics of Domain Walls in Orthoferrites 113
8.2 Kinks on the Domain Wall in Orthoferrites 118
8.3 Irreversibility of Nearsonic Dynamics of Domain Walls in Orthoferrites 121
8.4 Dissipative Structures in Supersonic Motion of Domain Walls in Orthoferrites 122
8.5 Relaxation of the Non–one–Dimensionalities on the Moving Domain Wall in Yttrium Orthoferrites 125
8.6 The Nonlinear Magnetoelastic Wave in Iron Borate 127

9. Dynamics of Bloch Lines and Their Clusters 131
9.1 Gyroscopic Dynamics of VBL 132
9.2 Experimental Methods of Recording the Bloch Lines 138
9.3 Registration of Dynamic VBL by the Method of High–Speed Photography 142
9.4 Soliton–Like Behaviour of VBL Clusters 153

References 168

Subject Index 179