

Contents

Preface

Chapter 1	Background of Ginzburg-Landau Equations	1
1.1	The Benard convection	1
1.2	The Couette-Taylor flow	6
1.3	The plane Poiseuille flow	12
1.4	The turbulent problem in chemical reaction	15
1.5	Transition from KS equation to Ginzburg-Landau equation	21
1.6	Ginzburg-Landau models in superconductivity	22

Chapter 2	Global Solutions and Global Attractors for One Dimensional Ginzburg-Landau Equations	27
2.1	Global solutions and global attractors	27
2.2	Analysis for traveling wave solutions	39
2.3	Instability of the quasi-periodic solutions	53
2.4	Nonlinear stability of the plane waves	64
2.5	Finite dimensional inertial manifolds	72
2.6	Exponential attractors	89
2.7	Structure of the inertial manifolds	94
2.8	Gevrey regularity	117
2.9	Determining nodes	129
2.10	Dynamical system structure and numerical analysis	138
2.11	Slow periodic solutions	146
2.12	Stability of traveling wave solutions	164
2.13	Upper bound estimates of winding numbers	176
2.14	Discrete attractors and their dimension estimates	186
2.15	Stability criterion for perturbed cubic-quintic nonlinear Schrödinger equations	206
2.16	Nonlinear instability of the plane waves	229

Chapter 3	Global Solutions and Asymptotic Behavior for Higher Dimensional Ginzburg-Landau Equations	237
3.1	Global solutions	237
3.2	Cauchy problem in local spaces	275
3.3	Global attractors for 2D case	307

3.4	The dynamical length	313
3.5	Hausdorff measures of level sets of solutions	327
3.6	Global attractors for 2D derivative Ginzburg-Landau equation	341
3.7	Gevrey regularity and approximate inertial manifolds	356
3.8	Global attractors for the case of unbounded domain	368
3.9	Time periodic solutions	383
3.10	Limits to nonlinear Schrödinger equations	392
3.11	Existence of almost periodic solutions	407
Chapter 4	Ginzburg-Landau Equations in Superconductivity	422
4.1	Cauchy problem	422
4.2	Global attractors	433
4.3	Hyperbolic Ginzburg-Landau Equations	440
4.4	Instability of symmetric vortices	446
Chapter 5	Ginzburg-Landau Model Equations	473
5.1	The case of $\deg(g, \partial\Omega) = 0$	474
5.2	The case of $\deg(g, \partial\Omega) \neq 0$	500
5.3	Equations of Ginzburg-Landau heat flows	543
5.4	Ginzburg-Landau equations and mean curvature flows	559
References		588