CONTENTS

		Page
1.	Introduction	1
2.	Vapor Deposition Technologies	4
	1 Scope	4
	2 Classification of Vapor Deposition Process	5
	3 Physical Vapor Deposition (PVD) Processes	8
	4 PVD Techniques for deposition of Metals, Alloys, and Compounds	44
	5 Chemical Vapor Deposition (CVD)	60
	6. Materials Deposited by PVD and CVD Techniques suggested reading	70
	References	72
3.	Thermal Spraying and Detonation Gun Processes	77
	1 Hard Coating with Thermal Spraying processes	77
	2 Processes	84
	3 Coating Materials / Consumables Feedstock Materials	101
	4 Conclusions	107
	References	
4.	Structure / Property Relationships For Hard Coatings	108
	1 Introduction	108
	2 Hard materials	110
	3 Microstructure and Morphology of Hard Coatings	115
	4 Influence of Microstructure on Coating Properties	149
	5 Adhesion and Coating/ Substrate Interface Studies	166
	6 Summary	171
	Acknowledgments	172
	References	173
5.	Characterization of Hard Coatings	181
	1 Introduction	181
	2 Evaluation of the Hardness of thin films	182
	3 Measurement of Coating Adhesion	194
	4 X-Ray characterization of ThinFilms	211
	5 Summary and Conclusions	221
	References	223
6.	Macro- and Micromechanical and Tribological Properties	229
	1 Introduction	229
	2 Measurement of Mechanical Properties	230
	3 Measurement of Friction and Wear	279
	4 Mechanical and Tribological Properties of Diamond and	200
	Amorphous Carbon Coatings	300
	5 Closure	341 342
	References	
7.	Applications to Cutting Tools	370
	1 Introduction	370 407
	References	
8.	Wear and Corrosion Resistant Hard Coatings For Non-Cutting Tool Applications	411
	1 Introduction	411
	2 Wear and Corrosion Phenomena	413

3	Selection of Coating Materials	414
4	Application of Hard Coatings for Wear and Corrosion	420
5	Diamond Coatings	452
Refer	ences	457
Cubic	Boron Nitride and Diamond-Related Thin Films	466
1	Introduction	466
2	Cubic Boron Nitride Films	467
3	Diamond – Related Materials	482
4	Concluding Remarks	512
Refer	ences	513
Addit	ional Reading	515
Sumn	nary, Developments, and Outlook	517
1	Current Industrial PVD Processes	517
2	CVD and PACVD Processes	519
3	Tribological Coatings and Their Applications	520
4	Alumina Coatings by CVD, PACVD and PVD Processes and First	
	Machining Studies	522
5	Environmental Concerns in Machining and forming	525
6	Decorative Hard Coatings	527
7	Superhard Coatings for Cutting Tools	528
8	Polycrystalline Superlattice Coatings	531
9	Novel Superhard Coatings	533
References		533
		535
	4 5 Refer Cubic 1 2 3 4 Refer Addit Sumr 1 2 3 4 5 6 7 8 9	4 Application of Hard Coatings for Wear and Corrosion 5 Diamond Coatings References Cubic Boron Nitride and Diamond-Related Thin Films 1 Introduction 2 Cubic Boron Nitride Films 3 Diamond – Related Materials 4 Concluding Remarks References Additional Reading Summary, Developments, and Outlook 1 Current Industrial PVD Processes 2 CVD and PACVD Processes 3 Tribological Coatings and Their Applications 4 Alumina Coatings by CVD, PACVD and PVD Processes and First Machining Studies 5 Environmental Concerns in Machining and forming 6 Decorative Hard Coatings 7 Superhard Coatings for Cutting Tools 8 Polycrystalline Superlattice Coatings 9 Novel Superhard Coatings