

CONTENTS

Preface	V
Chapter 1	
INTRODUCTION	1
1.1 Historical Background	1
1.2 Plasma Polymerization and Related Processes of Polymer Film Formation	3
References	5
Chapter 2	
FUNDAMENTALS OF PLASMA PHYSICS	9
2.1 Electrical Breakdown in a Gas and the d.c. Glow Discharge	9
2.2 Characterization of Low Temperature Plasma Generated by a Glow Discharge	12
2.3 Radio Frequency and Microwave Discharges	18
References	23
Chapter 3	
FUNDAMENTALS OF PLASMA CHEMISTRY	25
3.1 Reactions in a Plasma Volume	25
3.2 Reactions on Adjacent Surfaces	28
3.2.1 General Considerations of Surface Reactions	28
3.2.2 Fluorocarbon Plasmas in Contact with Solid Surfaces	31
References	35
Chapter 4	
FUNDAMENTALS OF PLASMA POLYMERIZATION	37
4.1 Basic Deposition Arrangements for Plasma Polymerization	37
4.1.1 Basic Reactor Geometries	37
4.1.2 Deposition Rate Parameters	39

4.1.3	Plasma Polymerization and the Frequency of the Discharge Excitation Voltage	45
4.1.4	Deposition Rate and the Application of Magnetic Fields	49
4.2	Kinetic Models of Plasma Polymerization	51
4.3	General Description of Plasma Polymer Films	73
4.3.1	Structure and Composition of a Plasma Polymer	73
4.3.1.1	IR Spectroscopy, NMR, ESCA and AES	76
4.3.1.2	The Presence of Free Radicals in Plasma Polymers	82
4.3.1.3	The Influence of Substrate Temperature and Bombardment from the Discharge.	89
4.3.1.4	Mechanical Properties - Adhesion, Internal Stress and Hardness.	96
4.3.1.5	Surface Properties - Abrasion, Friction, Wettability	98
4.3.4	Electrical Properties of Plasma Polymers	103
4.3.5	Optical Properties of Plasma Polymers	116
	References	118

Chapter 5

	APPLIED SYSTEMS FOR PLASMA POLYMERIZATION AND CLASSIFICATION OF PLASMA POLYMERS	127
5.1	Applied Plasma Polymerization Systems	127
5.2	Main Groups of Plasma Polymers	131
5.3	Hard Polymer and Hard Carbon Films	132
5.4	Metal-Containing Organic Films	136
5.4.1	Deposition Techniques	137
5.4.1.1	Simultaneous Plasma Polymerization of an Organic Gas or Vapor and Sputtering or Etching of a Metal from the Target Electrode	137
5.4.1.2	Simultaneous Plasma Polymerization of an Organic Gas or Vapor and Evaporation of a Metal	139
5.4.1.3	Plasma Polymerization of Metal Organic Compounds	140

5.4.1.4	Sputtering from a Composite Metal/Polymer Target	142
5.4.1.5	Simultaneous Evaporation of a Metal and a Polymer	143
5.4.1.6	Monitoring the Deposition Process	143
5.4.2	Processes of Deposition and Composite Film Structure	144
5.4.3	Basic Physical Properties	147
5.4.3.1	Optical Properties	147
5.4.3.2	Electrical Properties	148
5.4.3.3	Aging Effects	151
	References	155
 Chapter 6		
PROPERTIES AND APPLICATION		
	OF PLASMA-POLYMERIZED FILMS	161
6.1	Protective Coatings	161
6.2	Optical, Electrical and Magnetic Properties	162
6.3	Permselective Membranes	165
6.4	Biomedical Applications	169
6.5	Modifications of Conventional Polymer Materials by Plasma Treatment	172
	References	179
 Chapter 7		
POTENTIAL APPLICATIONS IN MICROELECTRONICS		183
7.1	Passivation and Protective Coatings	183
7.2	Active Elements in Electronics	186
7.3	Plasma polymerized photoconductive films	192
7.4	Concluding Note	200
	References	201
	APPENDIX	205
	References	205
	INDEX	207