

Contents

CHAPTER 1

Polyelectrolyte Restorative Materials

J. W. Nicholson	1
1.1 Introduction	1
1.2 Polyelectrolytes	3
1.3 The Rôle of Water	7
1.4 Zinc Polycarboxylate Cements	8
1.4.1 History and Clinical Uses	8
1.4.2 Structural Studies	9
1.4.3 Studies on Adhesion	10
1.5 Glass-Ionomer Cements	12
1.5.1 History and Clinical Uses	12
1.5.2 Clinical Manipulation	13
1.5.3 Fluoride Release	14
1.5.4 Test Methods	15
1.5.5 Glasses	17
1.5.6 Polymers	22
1.5.7 Structural Studies	25
1.5.8 Biocompatibility	29
1.5.9 Reinforced Glass-Ionomers	32
1.6 Resin-Modified Glass-Ionomers	36
1.6.1 Basic Chemistry	36
1.6.2 Structural Studies	39
1.6.3 Biocompatibility	40
1.6.4 Clinical Experience	40
1.7 Conclusions	42
1.8 References	43

CHAPTER 2

Glassy Polymers

R. L. Clarke	51
2.1 Unfilled Resins	52
2.1.1 Monomer Preparation	52

2.1.2	Free Radical Polymerisation	53
2.1.3	Polymerisation by the Dough Technique	56
2.1.4	Polymerisation by Microwaves	57
2.1.5	Polymerisation by Visible Light	58
2.1.6	Physical Properties of Poly(methyl methacrylate)	58
2.1.7	Mechanical Properties of Poly(methyl methacrylate)	60
2.1.8	Chemical and Biological Properties of Poly(methyl methacrylate)	61
2.1.9	Modified Acrylic Polymers	62
2.1.10	Higher Methacrylates	67
2.2	Filled Resins	67
2.2.1	The Monomer Phase	68
2.2.2	The Filler Phase	71
2.2.2.1	Manufacture of the Filler	73
2.2.2.2	Megafill Inserts	74
2.2.2.3	Particle Shape	74
2.2.3	Coupling Agents	74
2.2.4	The Curing System	76
2.2.4.1	Autopolymerising Systems	76
2.2.4.2	Light Cured Systems	76
2.2.4.3	Dual Cured Systems	78
2.2.5	Other Constituents	79
2.2.6	Classification of Dental Composites	79
2.2.7	Physical Properties of Composite Resins	83
2.2.8	Mechanical Properties of Composite Resins	84
2.2.9	Chemical and Biological Properties of Composite Resins	85
2.3	References	88

CHAPTER 3

Elastomeric Materials

M. Braden, S. Parker	91
3.1 Impression Materials (M. Braden)	91
3.1.1 Hydrocolloids	92
3.1.1.1 Reversible Hydrocolloids	92
3.1.1.2 Irreversible Hydrocolloids-Alginates	93
3.1.2 Elastomers	94
3.1.2.1 Condensation Silicones	94
3.1.2.2 Addition Silicones	95
3.1.2.3 Polysulphides	96
3.1.2.4 Imine Terminated Polyethers	98
3.1.2.5 A Photo-Polymerising Impression Material	98
3.1.2.6 The Future?	99
3.1.3 Physical Properties	99
3.1.3.1 Rheology	99
3.1.3.2 Stiffness of the Set Material	100
3.1.3.3 Viscoelastic Properties	100

3.1.3.4	Strength Properties	100
3.1.4	Biological Properties	100
3.1.5	General Conclusions	101
3.1.6	References	101
3.2	Soft Prosthesis Materials (S. Parker)	101
3.2.1	Soft Lining Materials	104
3.2.1.1	Soft Acrylic Materials	104
3.2.1.1.1	Heat Polymerised	104
3.2.1.1.2	Room Temperature Polymerising	107
3.2.1.2	Silicone Rubber Materials	107
3.2.1.2.1	Room Temperature Polymerising	107
3.2.1.2.2	Heat Polymerising	108
3.2.1.2.3	Acetoxy-Type	109
3.2.1.2.4	Addition Silicone	109
3.2.1.3	Elastomer/Methacrylate Systems	110
3.2.1.4	Fluoroethylene Copolymers	111
3.2.1.5	Natural Rubber	112
3.2.1.6	Vinyl Resins	112
3.2.1.7	Hydrophilic Acrylic Polymers	113
3.2.1.8	Polyurethanes	113
3.2.2	Tissue Conditioners	114
3.2.3	Maxillo-Facial Prosthesis Materials	115
3.2.3.1	Silphenylene Elastomers	115
3.2.3.2	Polyurethanes	116
3.2.3.3	Chlorinated Polyethylene	116
3.2.4	Physical Properties	117
3.2.4.1	Water Uptake Characteristics	117
3.2.4.2	Viscoelastic Properties	119
3.2.4.3	Adhesion to PMMA	120
3.2.4.4	Stress/Strain Characteristics	121
3.2.4.5	Rupture Properties	121
3.2.4.6	Wettability	122
3.2.5	References	123