

DISCOVERING POLYURETHANES

Konrad Uhlig



Contents

1 The polyurethane age	9
2 The PU market and resources	13
3 Classification of types	21
3.1 Forms of polyurethane	21
3.2 Applications according to form	23
3.3 A to Z of applications	44
4 Why polyurethanes?	
List of properties	55
4.1 Physical and chemical properties according to forms	55
4.2 Fire behaviour	72
4.3 PU and health	75
4.4 An overview of tests	76
5 How is polyurethane produced?	83
5.1 General Technology	83
5.2 Special Technology	88
5.3 Separate methods	96
6 The chemistry must be right!	101
6.1 Chemical principles	101
6.2 Production and stoichiometry	102
6.3 Raw materials and their origins	109
6.3.1 Di-/polyisocyanates	110
6.3.2 Polyols, polyamines	117
6.3.3 Crosslinking agents/chain extenders	121
6.3.4 Additives	124
6.3.5 Delivery and handling of raw materials; Safety at work	134
6.3.6 Trademarks and manufacturers (selection)	136
6.4 Macromolecular structure of polyurethanes	136
6.5 Research and development	140
6.6 Is the chemistry right? Analysis of polyurethanes	145

7 The quality must be right	148
8 Waste and recycling	151
9 Polyurethane know-how	166
9.1 Who knows what?	166
9.2 What is where available?	167
10 Prospects	169
Bibliography	171
List of illustrations	175
Index	177