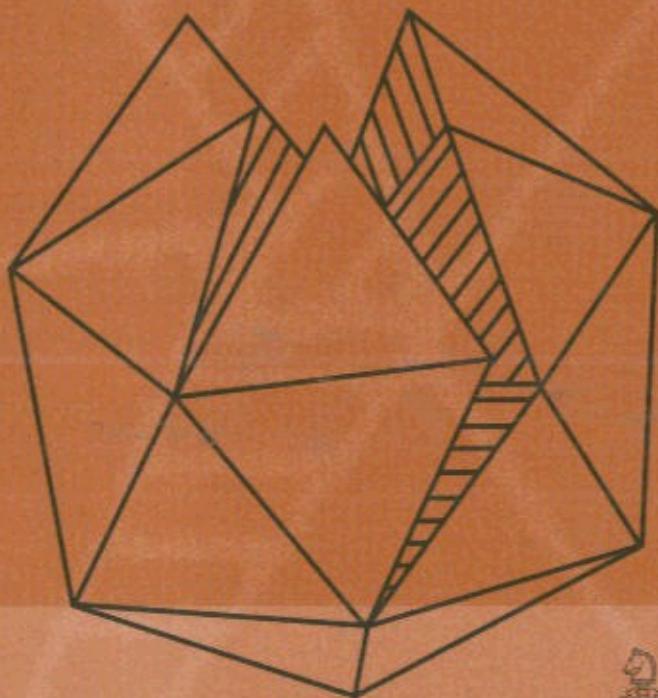


P. M. Ossi

Disordered Materials

An Introduction



Springer

Contents

1. Solids:	.	.
Geometrical and Symmetrical Properties	.....	1
1.1 The Platonic Solids and Their Duals	.....	1
1.2 Elements of Symmetry in Space	.....	9
1.3 Polytopes in the Four Dimensional Space and Their Projections onto the Physical Space	.....	13
1.4 Elements of Crystallography	.....	17
1.5 The Reciprocal Lattice	.....	27
2. Structural Order	.....	31
2.1 Order and Disorder	.....	31
2.2 Rules of Order	.....	33
2.3 Order Parameters	.....	35
2.4 Cellular Disorder and Topological Disorder	.....	40
2.5 Structurally Disordered Materials	.....	42
2.6 Description of Disorder Through Entropy	.....	47
3. The Glass Transition	.....	53
3.1 The Phenomenology of Glass Transition	.....	53
3.2 Theories of the Glass Transition	.....	65
3.3 Ease of Glass Formation	.....	76
4. The Structure of Disordered Systems	.....	87
4.1 Why We Study the Structure of Amorphous Systems	.....	87
4.2 The Distribution Functions	.....	89
4.3 Experimental Techniques: Diffraction	.....	98
4.4 Experimental Techniques: EXAFS	.....	115
4.5 Experimental Techniques: Mössbauer Spectroscopy	.....	124
4.6 Experimental Techniques: Vibrational Spectroscopies	.....	128
4.7 Short Range Order	.....	143
4.8 Medium Range Order	.....	157
4.9 Structural Models	.....	169

XII Contents

5. Clusters	179
5.1 Definition of an Atomic Cluster	179
5.2 Synthesis and Detection of Atomic Clusters	185
5.3 Structure of van der Waals Clusters	187
5.4 Structure of Alkali-Metal Clusters	201
5.5 The Fullerene C ₆₀	216
5.6 Cluster-Assembled, Nanostructured Materials	225
6. Quasicrystals	231
6.1 Periodic and Aperiodic Crystals	231
6.2 The Enlarged Notion of Crystal	238
6.3 Quasicrystals and Tilings	243
6.4 Model Structures and Crystalline Approximants	249
6.5 Structural Properties and Stability of Real Quasicrystals	261
A. Appendix	275
References	279
Index	285