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Three-Dimensional Structure 3.1 Introduction; 3.2 Molecular Magnetism; 3.3 Magnetic Bricks; 3.4 A Game of Bricks and Pieces of Mortar; 3.5 Structure of Molecule-Based Magnets Containing Three Spin Carriers, with a Fully Interlocked Structure; 3.6 Magnetic Properties; 3.6.1 The Temperature Dependence of Magnetic Susceptibility; 3.6.2 Field Dependencies of the Magnetization; 3.7 Some Further Considerations; 3.8 A Few Words to Conclude; References; 4 Transition Metal-Incorporating Catenanes; 4.1 Introduction 4.2 Interlocked Compounds Containing Metals 4.2.1 Metal-Containing Rotaxanes; 4.2.2 Metal-Templated Synthesis of Catenanes; 4.2.3 Organometallic Catenanes and Rotaxanes; 4.2.4 Self-Assembly of a [2] Catenane Incorporating (en)Pd(II) Units; 4.2.4.1 Quantitative Self-Assembly of a Coordination Catenane; 4.2.4.2 Mechanism of the Rapid Interconversion: Mobius Strip Mechanism; 4.2.4.3 Irreversible Interlock of Molecular Rings; 4.2.4.4 Electronic Effects in the Self-Assembly of Pd(II)-Linked Catenanes; 4.2.5 Made-to-Order Assembling of Pd(II)-Linked Catenanes 4.2.5.1 Quantitative Formation of Catenanes from Rectangular Molecular Boxes 4.2.5.2 Selective Formation of Catenanes from Three Species-Eight Components; 4.2.5.3 Scope and Limitations; 4.3 Conclusion; References; 5 Catenane and Rotaxane Motifs in Interpenetrating and Self-Penetrating Coordination Polymers; 5.1 Introduction; 5.1.1 Nets; 5.1.2 Interpenetration of Nets; 5.2 Interpenetrating 1D Polymers; 5.3 Interpenetrating 2D Networks; 5.3.1 Parallel Interpenetration of 2D Frameworks; 5.3.1.1 Interpenetrating Pairs of Sheets; 5.3.1.2 Parallel Interpenetration of more than Two Sheets 5.3.1.3 Parallel Interpenetration of Sheets Other than (6, 3) and (4, 4) 5.3.1.4 Parallel Interpenetration of 2D Nets to Give a 3D Interlocked Composite; 5.3.2 Inclined Interpenetration of 2D Frameworks; 5.3.2.1 More Than One Sheet Passing Through Any Ring; 5.4 Interpenetrating 3D Networks; 5.4.1 Interpenetrating 3-Connected 3D Nets; 5.4.1.1 Interpenetrating (10,3)-a Nets; 5.4.1.2 Interpenetrating (10,3)-b Nets; 5.4.1.3 Interpenetrating (8,3)-c Nets; 5.4.2 Interpenetrating 4-Connected 3D Nets; 5.4.2.1 Interpenetrating Diamond-Like Nets; 5.4.2.2 Interpenetrating Quartz-Like Nets 5.4.2.3 Interpenetrating PtS-Like Nets

Sommario/riassunto

This journey through the fascinating world of molecular topology focuses on catenanes, rotaxanes and knots, their synthesis, properties, and applications and the theory of interlocking and interpenetrating molecules. Nearly one hundred years of progress have passed since Willstätter's speculative vision of a molecule consisting of two interlinked rings. But even today the synthesis of such structures are a challenge to the creativity of synthetic chemists. These molecules are not only of academic interest, since they occur naturally. In such molecules as DNA, knots and related topological feat