
Contents

<i>Preface</i>	<i>page ix</i>
1 Introduction	1
1.1 Graphs	1
1.2 Topological notions	2
1.3 Representation of maps	9
1.4 Symmetry groups of maps	12
1.5 Types of regularity of maps	18
1.6 Operations on maps	21
2 Two-faced maps	24
2.1 The Goldberg–Coxeter construction	28
2.2 Description of the classes	31
2.3 Computer generation of the classes	36
3 Fullerenes as tilings of surfaces	38
3.1 Classification of finite fullerenes	38
3.2 Toroidal and Klein bottle fullerenes	39
3.3 Projective fullerenes	41
3.4 Plane 3-fullerenes	42
4 Polycycles	43
4.1 (r, q) -polycycles	43
4.2 Examples	45
4.3 Cell-homomorphism and structure of (r, q) -polycycles	48
4.4 Angles and curvature	51
4.5 Polycycles on surfaces	53
5 Polycycles with given boundary	56
5.1 The problem of uniqueness of (r, q) -fillings	56
5.2 $(r, 3)$ -filling algorithms	61

6	Symmetries of polycycles	64
6.1	Automorphism group of (r, q) -polycycles	64
6.2	Isohedral and isogonal (r, q) -polycycles	65
6.3	Isohedral and isogonal $(r, q)_{gen}$ -polycycles	71
7	Elementary polycycles	73
7.1	Decomposition of polycycles	73
7.2	Parabolic and hyperbolic elementary $(R, q)_{gen}$ -polycycles	76
7.3	Kernel-elementary polycycles	79
7.4	Classification of elementary $(\{2, 3, 4, 5\}, 3)_{gen}$ -polycycles	83
7.5	Classification of elementary $(\{2, 3\}, 4)_{gen}$ -polycycles	89
7.6	Classification of elementary $(\{2, 3\}, 5)_{gen}$ -polycycles	90
7.7	Appendix 1: 204 sporadic elementary $(\{2, 3, 4, 5\}, 3)$ -polycycles	93
7.8	Appendix 2: 57 sporadic elementary $(\{2, 3\}, 5)$ -polycycles	102
8	Applications of elementary decompositions to (r, q)-polycycles	107
8.1	Extremal polycycles	108
8.2	Non-extensible polycycles	116
8.3	2-embeddable polycycles	121
9	Strictly face-regular spheres and tori	125
9.1	Strictly face-regular spheres	126
9.2	Non-polyhedral strictly face-regular $(\{a, b\}, k)$ -spheres	136
9.3	Strictly face-regular $(\{a, b\}, k)$ -planes	143
10	Parabolic weakly face-regular spheres	168
10.1	Face-regular $(\{2, 6\}, 3)$ -spheres	168
10.2	Face-regular $(\{3, 6\}, 3)$ -spheres	169
10.3	Face-regular $(\{4, 6\}, 3)$ -spheres	169
10.4	Face-regular $(\{5, 6\}, 3)$ -spheres (fullerenes)	170
10.5	Face-regular $(\{3, 4\}, 4)$ -spheres	177
10.6	Face-regular $(\{2, 3\}, 6)$ -spheres	179
11	General properties of 3-valent face-regular maps	181
11.1	General $(\{a, b\}, 3)$ -maps	184
11.2	Remaining questions	186
12	Spheres and tori that are aR_i	187
12.1	Maps aR_0	187
12.2	Maps $4R_1$	189
12.3	Maps $4R_2$	195
12.4	Maps $5R_2$	203
12.5	Maps $5R_3$	204

Cambridge University Press

978-0-521-87307-9 - Geometry of Chemical Graphs: Polycycles and Two-faced Maps

Michel Deza and Mathieu Dutour Sikirić

Table of Contents

[More information](#)

<i>Contents</i>		vii
13	Frank-Kasper spheres and tori	218
13.1	Euler formula for $(\{a, b\}, 3)$ -maps bR_0	218
13.2	The major skeleton, elementary polycycles, and classification results	219
14	Spheres and tori that are bR_1	225
14.1	Euler formula for $(\{a, b\}, 3)$ -maps bR_1	225
14.2	Elementary polycycles	229
15	Spheres and tori that are bR_2	234
15.1	$(\{a, b\}, 3)$ -maps bR_2	234
15.2	$(\{5, b\}, 3)$ -tori bR_2	237
15.3	$(\{a, b\}, 3)$ -spheres with a cycle of b -gons	239
16	Spheres and tori that are bR_3	246
16.1	Classification of $(\{4, b\}, 3)$ -maps bR_3	246
16.2	$(\{5, b\}, 3)$ -maps bR_3	252
17	Spheres and tori that are bR_4	256
17.1	$(\{4, b\}, 3)$ -maps bR_4	256
17.2	$(\{5, b\}, 3)$ -maps bR_4	270
18	Spheres and tori that are bR_j for $j \geq 5$	274
18.1	Maps bR_5	274
18.2	Maps bR_6	281
19	Icosahedral fullerooids	284
19.1	Construction of I -fullerooids and infinite series	285
19.2	Restrictions on the p -vectors	288
19.3	From the p -vectors to the structures	291
	<i>References</i>	295
	<i>Index</i>	304