

Contents

Foreword	<i>XI</i>
About the Authors	<i>XIII</i>
Acknowledgments	<i>XVII</i>

Introduction	1
Nanochemistry – Why Should We Care?	1
What is Nanochemistry?	4
This Book – Instructions for Use	7
References	10

1	An Introduction to Nanochemistry Concepts	11
1.1	Nanochemistry – What's in a Name?	11
1.2	On the Surface of Things	12
1.3	Size is Everything...Almost	19
1.4	Shape	23
1.5	Self-Assembly	26
1.6	Two Words About Defects	34
1.7	The Bio–Nano Interface	37
1.8	Safety	45
	References	47
2	Silica	51
2.1	Introduction	51
2.2	Surface	52
2.3	Size	56
2.4	Shape	61
2.5	Self-Assembly	64
2.6	Defects	71
2.7	BioNano	75
2.8	Conclusion	78
2.9	Silica – NanoFood for Thought	79
	References	82

3	Gold	85
3.1	Introduction	85
3.2	Surface	85
3.3	Size	89
3.4	Shape	94
3.5	Self-Assembly	97
3.6	Defects	100
3.7	BioNano	104
3.8	Gold – NanoFood for Thought	107
	References	110
4	Polydimethylsiloxane	113
4.1	Introduction	113
4.2	Surface	114
4.3	Size	118
4.4	Shape	123
4.5	Self-Assembly	128
4.6	Defects	131
4.7	BioNano	132
4.8	PDMS – NanoFood for Thought	137
	References	139
5	Cadmium Selenide	141
5.1	Introduction	141
5.2	Surface	142
5.3	Size	145
5.4	Shape	151
5.5	Self-Assembly	157
5.6	Defects	160
5.7	BioNano	163
5.8	CdSe – NanoFood for Thought	167
	References	170
6	Iron Oxide	173
6.1	Introduction	173
6.2	Surface	173
6.3	Size	179
6.4	Shape	184
6.5	Self-Assembly	187
6.6	BioNano	189
6.7	Iron Oxide – NanoFood for Thought	193
	References	194

7	Carbon	197
7.1	Introduction	197
7.2	Surface	198
7.3	Size	203
7.4	Shape	205
7.5	Self-Assembly	207
7.6	BioNano	211
7.7	Conclusion	213
7.8	Carbon – NanoFood for Thought	214
	References	216
8	Nanochemistry Case Histories	217
8.1	Introduction	217
8.2	Case #1	218
8.3	Case #2	225
8.4	Conclusions	232
	References	233
9	Nanochemistry Diagnostics	235
9.1	A Reference Sheet	235
9.2	Microscopy Techniques	235
9.3	Diffraction Techniques	238
9.4	Spectroscopic Techniques	239
9.5	Magnetic Techniques	242
9.6	Separation Techniques	243
9.7	Thermal Techniques	243
9.8	Adsorption Techniques	243
9.9	Electrical Techniques	244
10	Challenges in Nanochemistry	245
	References	249
	Index	251

