

Table of Contents

Chapter 1: General introduction	3
1.1 Nanotechnology	5
1.2 Supramolecular Chemistry	8
1.3 Mesoporous silica materials.....	12
1.4 Stimuli-responsive gated materials.....	23
1.5 Janus particles	42
1.6 Enzymes.....	48
1.7 References.....	53
Chapter 2: Objectives	59
3. Enzyme-Controlled Nanodevice for Acetylcholine-Triggered Cargo Delivery Based on Janus Au-Mesoporous Silica Nanoparticles	63
3.1 Abstract	67
3.2 Introduction.....	67
3.3 Results and discussion.....	69
3.4 Conclusions.....	79
3.5 References.....	80
3.6 Supporting Information	83
4. Au-Mesoporous Silica Nanoparticles Gated with Disulfide-Linked Oligo(Ethylene Glycol) Chains for Tunable Cargo Delivery Mediated by an Integrated Enzymatic Control Unit	107
4.1 Abstract	111
4.2 Introduction.....	111
4.3 Results and discussion.....	113
4.4 Conclusions.....	124
4.5 References.....	125
4.6 Supporting Information	128
5. Interactive Models of Communication at the Nanoscale Using Nanoparticles that Talk to One Another	141
5.1 Abstract	145

Table of Contents

5.2 Introduction.....	145
5.3 Results and discussion	147
5.4 Conclusions.....	158
5.5 Methods	158
5.6 References.....	163
5.7 Supporting Information	167
6. Hybrid Nanocarriers Act by Processing Logic Tasks: Toward the Design of Nanobots Capable of Reading Information from the Environment.....	177
6.1 Abstract	181
6.1 Introduction.....	181
6.3 Results and discussion.....	186
6.4 Conclusions.....	193
6.5 References.....	194
6.6 Supporting Information	197
7. Versatile New Paradigm for the Design of Optical Nanosensors Based on Enzyme-Mediated Detachment of Labelled-Reporters: The Example of Urea Detection	215
7.1 Abstract	219
7.2 Introduction.....	219
7.3 Results and discussion.....	222
7.4 Conclusions.....	230
7.5 Experimental Section.....	231
7.6 References.....	236
7.7 Supporting Information	238
Chapter 8: Conclusions and Perspectives.....	243