

# General index

<b>GENERAL INTRODUCTION .....</b>	<b>1</b>
1. MOLECULAR RECOGNITION .....	4
1.1. <i>Sensors as an application of molecular recognition</i> .....	7
1.2. <i>Biosensors: Characteristics and classification</i> .....	15
1.3. <i>Current tendencies in biosensing</i> .....	24
2. NANOTECHNOLOGY.....	25
3. ORGANIC-INORGANIC HYBRID POROUS MATERIALS .....	28
3.1. <i>Types of porous materials</i> .....	30
3.2. <i>Porous anodic alumina (PAA)</i> .....	31
3.3. <i>Anodic alumina functionalization</i> .....	33
4. GATED MATERIALS .....	41
5. IMPORTANCE OF GLOBAL INFECTIOUS DISEASE CONTROL.....	49
5.1. <i>Vegetal-infecting pathogens</i> .....	50
5.2. <i>Animal-infecting pathogens</i> .....	54
5.2.1. Pathogens and respiratory diseases.....	56
6. REFERENCES .....	59
<b>OBJECTIVES.....</b>	<b>83</b>
<b>CHAPTER I   ADVANCEMENTS IN NANOMATERIAL-ENHANCED BIOSENSING FOR THE DETECTION OF XYLELLA FASTIDIOSA.....</b>	<b>87</b>
1. ABSTRACT.....	90
2. INTRODUCTION.....	90
3. RESULTS AND DISCUSSION .....	96

## GENERAL INDEX

3.1. <i>Release assays</i> .....	100
3.2. <i>Stability evaluation in blank and inoculated competitive media</i> .....	102
3.3. <i>Sensitivity studies</i> .....	103
3.4. <i>Study of the system behavior with different sub-species of Xylella fastidiosa</i> 105	
3.5. <i>Detection of Xylella fastidiosa in real field samples.</i> .....	106
4. CONCLUSION.....	109
5. MATERIALS AND METHODS.....	110
5.1. <i>General techniques</i> .....	110
5.2. <i>Chemicals</i> .....	110
5.3. <i>Oligonucleotides design</i> .....	110
5.4. <i>Synthesis of support S<sub>1</sub></i> .....	111
5.5. <i>Synthesis of support S<sub>2</sub></i> .....	111
5.6. <i>Synthesis of support S<sub>3</sub></i> .....	111
5.7. <i>Synthesis of support S<sub>3-O<sub>2</sub></sub></i> .....	111
5.8. <i>Characterization of the prepared supports</i> .....	112
5.9. <i>Release experiments of support S<sub>3-O<sub>2</sub></sub></i> .....	112
5.10. <i>Plant extracts preparation</i> .....	112
5.11. <i>Samples validation</i> .....	113
5.12. <i>Statistical analysis.</i> .....	113
6. REFERENCES.....	114
<b>CHAPTER II   TARGETED DETECTION OF MYCOBACTERIUM TUBERCULOSIS USING AN ANTIBODY-COATED NANOPOROUS ANODIC ALUMINA BIOSENSOR FOR MPT64 ANTIGEN: A NOVEL APPROACH FOR TUBERCULOSIS SCREENING .....</b>	<b>121</b>
1. ABSTRACT.....	124

2. INTRODUCTION.....	124
3. RESULTS AND DISCUSSION .....	131
3.1. <i>Design, synthesis and characterization of gated NAA materials .....</i>	131
3.2. <i>Purified antigen-triggered cargo release .....</i>	136
3.3. <i>Specificity and sensitivity assays.....</i>	136
3.4. <i>Detection of M. tuberculosis in competitive media and clinical samples .....</i>	139
4. CONCLUSIONS.....	144
5. MATERIALS AND METHODS.....	145
5.1. <i>Reagents .....</i>	145
5.2. <i>Material characterization .....</i>	146
5.3. <i>Linker peptide design .....</i>	146
5.4. <i>ELISA peptides assay.....</i>	146
5.5. <i>Synthesis of solids .....</i>	147
5.6. <i>Cargo quantification .....</i>	148
5.7. <i>Detection protocol .....</i>	148
5.8. <i>Quantification curve of MPT64 protein recognition .....</i>	149
5.9. <i>Specificity .....</i>	149
5.10. <i>Validation in competitive media .....</i>	150
5.11. <i>MPT64 detection in patient samples .....</i>	150
6. REFERENCES .....	151
<b>CHAPTER III   APTAMER-CAPPED NANOPOROUS ANODIC ALUMINA FOR SARS-COV-2 SPIKE PROTEIN DETECTION.....</b>	<b>157</b>
1. ABSTRACT.....	161
2. INTRODUCTION.....	161

## GENERAL INDEX

3. RESULTS AND DISCUSSION .....	165
3.1. <i>Synthesis and characterization of gated NAA</i> .....	165
3.2. <i>Release assays</i> .....	168
3.3. <i>Sensitivity and specificity studies</i> .....	170
3.4. <i>Detection of VSV-S in competitive media and inoculated clinical samples</i> ....	173
3.5. <i>Study of the system behavior with different S proteins from different SARS-CoV-2 variants of concern</i> .....	175
4. CONCLUSION.....	176
5. MATERIALS AND METHODS .....	177
5.1. <i>General Techniques</i> .....	177
5.2. <i>Reactives and reagents</i> .....	177
5.3. <i>Oligonucleotides Design</i> .....	177
5.4. <i>Synthesis of solids</i> .....	177
5.5. <i>Cargo quantification</i> .....	178
5.6. <i>Virus obtention</i> .....	178
5.7. <i>Detection protocol</i> .....	179
5.8. <i>Quantification curve of SARS-CoV-2 spike protein recognition</i> .....	180
5.9. <i>Selectivity</i> .....	180
5.10. <i>Validation in competitive media</i> .....	180
5.11. <i>Study of the system behavior with different VSV-S variants</i> .....	181
6. REFERENCES .....	181
7. SUPPORTING INFORMATION.....	186

<b>CHAPTER IV   NUCLEIC ACID DETECTION WITH GATED NANOPOROUS ANODIC ALUMINA AND CRISPR-CAS12A .....</b>	<b>191</b>
1. ABSTRACT.....	194
2. INTRODUCTION.....	194
3. RESULTS AND DISCUSSION .....	198
3.1. <i>Design, synthesis, and characterization of gated NAA materials .....</i>	198
3.2. <i>CRISPR-Cas12a regulation of cargo release .....</i>	202
3.3. <i>Specificity and sensitivity assays.....</i>	207
3.4. <i>Detection of SARS-CoV-2 in clinical samples .....</i>	209
4. CONCLUSIONS .....	211
5. MATERIALS AND METHODS .....	212
5.1. <i>Reagents .....</i>	212
5.2. <i>Material characterization .....</i>	213
5.3. <i>Material preparation for release assays .....</i>	213
5.4. <i>CRISPR-Cas12a-based detection .....</i>	214
5.5. <i>Patient samples.....</i>	215
5.6. <i>Nucleic acid amplification by RT-RP .....</i>	215
5.7. <i>SARS-CoV-2 detection in patient samples .....</i>	215
5.8. <i>RT-qPCR validation.....</i>	216
6. REFERENCES .....	216
7. SUPPORTING INFORMATION .....	222
<b>DISCUSSION .....</b>	<b>227</b>
<b>CONCLUSIONS.....</b>	<b>235</b>