

# Table of Contents

<b>Table of Contents</b> .....	1
<b>List of Figures</b> .....	<b>Error! Bookmark not defined.</b>
<b>List of Tables</b> .....	<b>Error! Bookmark not defined.</b>
<b>List of Appendices</b> .....	<b>Error! Bookmark not defined.</b>
<b>1. SUMMARY</b> .....	<b>Error! Bookmark not defined.</b>
<b>2. ABBREVIATIONS/ACRONYMS</b> .....	<b>Error! Bookmark not defined.</b>
<b>3. Introduction</b> .....	<b>Error! Bookmark not defined.</b>
3.1 Drug delivery systems .....	<b>Error! Bookmark not defined.</b>
3.1.1 Matrix systems .....	<b>Error! Bookmark not defined.</b>
3.2.2 Membrane-controlled drug delivery systems .....	<b>Error! Bookmark not defined.</b>
3.2.3 Osmotic pump systems .....	<b>Error! Bookmark not defined.</b>
3.2 Polymerization .....	<b>Error! Bookmark not defined.</b>
3.4.1 Free radical polymerization .....	<b>Error! Bookmark not defined.</b>
3.4.2 Controlled/living radical polymerization (CRP) .....	<b>Error! Bookmark not defined.</b>
3.4.3 Atom Transfer Radical Polymerization (ATRP) .....	<b>Error! Bookmark not defined.</b>
3.4.3.1 ATRP components .....	<b>Error! Bookmark not defined.</b>
3.3 Stimuli-responsive materials .....	<b>Error! Bookmark not defined.</b>
3.3.1 Thermo-responsive polymers .....	<b>Error! Bookmark not defined.</b>
3.3.1.1 Theory of thermo-responsive polymers .....	<b>Error! Bookmark not defined.</b>
3.3.1.2 Classification of thermo-responsive polymers: .....	<b>Error! Bookmark not defined.</b>
3.3.2 pH-responsive polymers .....	<b>Error! Bookmark not defined.</b>
3.3.2.1 Classification of pH-responsive polymers .....	<b>Error! Bookmark not defined.</b>
3.3.3 Photo-responsive polymers .....	<b>Error! Bookmark not defined.</b>
3.2.3.1 Irreversible photo-responsive moieties .....	<b>Error! Bookmark not defined.</b>
3.2.3.2 Reversible photo-responsive moieties .....	<b>Error! Bookmark not defined.</b>
3.3.4 <i>Magnetic responsive polymers</i> .....	<b>Error! Bookmark not defined.</b>
3.3.5 Redox-responsive polymers .....	<b>Error! Bookmark not defined.</b>
3.4 Dual or multi-stimuli responsive polymers .....	<b>Error! Bookmark not defined.</b>
3.4.1 Thermo and light responsive polymers .....	<b>Error! Bookmark not defined.</b>
3.4.2 Thermo and pH responsive polymers .....	<b>Error! Bookmark not defined.</b>
3.4.3 Multi-stimuli responsive polymers .....	<b>Error! Bookmark not defined.</b>

3.5 Applications of stimuli-responsive polymers as drug delivery systems .....	<b>Error! Bookmark not defined.</b>
3.5.1 Applications in cancer therapy: .....	<b>Error! Bookmark not defined.</b>
3.5.2 Applications as insulin carriers.....	<b>Error! Bookmark not defined.</b>
<b>4. Aim of the study .....</b>	<b>Error! Bookmark not defined.</b>
<b>5. Materials and methods .....</b>	<b>Error! Bookmark not defined.</b>
5.1 Materials .....	<b>Error! Bookmark not defined.</b>
5.2 Methods.....	<b>Error! Bookmark not defined.</b>
5.2.1 Gel permeation chromatography (GPC) .....	<b>Error! Bookmark not defined.</b>
5.2.2 Thermal properties by Differential Scanning Calorimetry (DSC) ..	<b>Error! Bookmark not defined.</b>
5.2.3 Ferric contents and residual solvents by Thermogravimetric Analysis (TGA) ....	<b>Error! Bookmark not defined.</b>
5.2.4 Raman spectroscopy .....	<b>Error! Bookmark not defined.</b>
5.2.5 Photoisomerization.....	<b>Error! Bookmark not defined.</b>
5.2.6 Synthesis of Poly(2-(N,N-Dimethylamino) ethyl methacrylate) PDMAEMA	<b>Error! Bookmark not defined.</b>
5.2.7 Quaternization of PDMAEMA with alkyl and benzyl halides .....	<b>Error! Bookmark not defined.</b>
5.2.8 Complexation with iron.....	<b>Error! Bookmark not defined.</b>
5.2.9 Calculation of the effective magnetic moment of polymers PXRFe .....	<b>Error! Bookmark not defined.</b>
5.2.10 Preparation of azobenzene species. ....	<b>Error! Bookmark not defined.</b>
5.2.10.1 Symmetric molecules targeting the cross-linking of polymeric PDMAEMA chains.....	<b>Error! Bookmark not defined.</b>
5.2.10.2 A methacrylate bearing an azobenzene pending group used for the co-polymerization with 2-(N,N-dimethylamino)ethyl methacrylate. ....	<b>Error! Bookmark not defined.</b>
5.2.11 Preparation of magnetic random copolymers.....	<b>Error! Bookmark not defined.</b>
5.2.11.1 Syntheses of poly(4-(phenyldiazenyl)phenyl-methacrylate-co-N,N-dimethylaminoethyl methacrylate) PDAX (X = 4, 6, 8) .....	<b>Error! Bookmark not defined.</b>
5.2.11.2 Syntheses of quaternized copolymers PDAX/Y (X = 4, 6, 8 and Y = 10, 50, 100) .....	<b>Error! Bookmark not defined.</b>
5.2.11.3 Syntheses of magnetic copolymers PDAX/YF (X = 4, 6, 8 and Y = 10, 50, 100).....	<b>Error! Bookmark not defined.</b>
5.2.11.4 Computational details.....	<b>Error! Bookmark not defined.</b>
5.2.12 Preparation techniques of the model drug-loaded PDAX copolymer .....	<b>Error! Bookmark not defined.</b>

5.2.12.1 Encapsulation of <b>RPS</b> using double emulsion solvent extraction process.	<b>Error! Bookmark not defined.</b>
5.2.12.2 Encapsulation of Prednisolone ( <b>PRD</b> ) using solid-in-oil-in-water - solvent extraction process .....	<b>Error! Bookmark not defined.</b>
5.2.13 Calibration curve of studied materials.....	<b>Error! Bookmark not defined.</b>
5.2.14 Compression of tablets .....	<b>Error! Bookmark not defined.</b>
5.2.15 Friability test .....	<b>Error! Bookmark not defined.</b>
5.2.16 Disintegration test. ....	<b>Error! Bookmark not defined.</b>
5.2.17 Dissolution studies .....	<b>Error! Bookmark not defined.</b>
<b>6. Results and discussion.....</b>	<b>Error! Bookmark not defined.</b>
6.1 Chemistry .....	<b>Error! Bookmark not defined.</b>
6.1.1 Overview of magnetic materials .....	<b>Error! Bookmark not defined.</b>
6.1.2 Synthesis of magnetic polymer .....	<b>Error! Bookmark not defined.</b>
6.1.2.1 Synthesis of PDMAEMA .....	<b>Error! Bookmark not defined.</b>
6.1.2.2 Quaternization of PDMAEMA .....	<b>Error! Bookmark not defined.</b>
6.1.2.3 Complexation of PDMAEMA with iron .....	<b>Error! Bookmark not defined.</b>
6.1.2.4 Physicochemical tests of polymers .....	<b>Error! Bookmark not defined.</b>
6.1.3 Hybridization between azobenzene and poly(2-(dimethylamino)ethyl methacrylate) .....	<b>Error! Bookmark not defined.</b>
<b>6.1.3.1 Background of azobenzene.....</b>	<b>Error! Bookmark not defined.</b>
<b>6.1.3.2 Preparation of azobenzene species. ....</b>	<b>Error! Bookmark not defined.</b>
<b>6.1.3.3 Cross-link between azobenzene compounds and poly(2-dimethylamino)ethyl methacrylate .....</b>	<b>Error! Bookmark not defined.</b>
6.1.4 Copolymer .....	<b>Error! Bookmark not defined.</b>
6.1.4.1 Overview on copolymer .....	<b>Error! Bookmark not defined.</b>
6.1.4.2 Synthesis of co-polymer by uncontrolled polymerization .....	<b>Error! Bookmark not defined.</b>
6.1.4.3 Quaternization and complexation of co-polymer.....	<b>Error! Bookmark not defined.</b>
6.1.5 Stimuli-responsive test .....	<b>Error! Bookmark not defined.</b>
6.1.5.1 Magnetic test .....	<b>Error! Bookmark not defined.</b>
6.1.5.2 Photoresponsive test .....	<b>Error! Bookmark not defined.</b>
6.1.5.3 pH-responsive properties .....	<b>Error! Bookmark not defined.</b>
6.1.6 Conclusion.....	<b>Error! Bookmark not defined.</b>
6.2 Pharmaceuticals.....	<b>Error! Bookmark not defined.</b>
6.2.1 Overview .....	<b>Error! Bookmark not defined.</b>

6.2.2 Encapsulation .....	<b>Error! Bookmark not defined.</b>
6.2.2.1 Microencapsulation techniques: .....	<b>Error! Bookmark not defined.</b>
6.2.3 Model drugs used in this work.....	<b>Error! Bookmark not defined.</b>
6.2.4 Encapsulation using spray drying technique.....	<b>Error! Bookmark not defined.</b>
6.2.5 Encapsulation using solvent evaporation method .....	<b>Error! Bookmark not defined.</b>
6.2.5.1 Double emulsion evaporation method .....	<b>Error! Bookmark not defined.</b>
6.2.5.2 Solid-in-oil-in-water (s/o/w) emulsion technique .....	<b>Error! Bookmark not defined.</b>
6.2.6 Coating .....	<b>Error! Bookmark not defined.</b>
6.2.7 Stimuli-responsive test on the coated tablet.....	<b>Error! Bookmark not defined.</b>
6.2.7.1 pH-sensitivity .....	<b>Error! Bookmark not defined.</b>
6.2.7.2 Photoresponsive .....	<b>Error! Bookmark not defined.</b>
6.2.8 Conclusion.....	<b>Error! Bookmark not defined.</b>
<b>7. General conclusion .....</b>	<b>Error! Bookmark not defined.</b>
<b>8. Perspectives.....</b>	<b>Error! Bookmark not defined.</b>
<b>9. Appendix.....</b>	<b>Error! Bookmark not defined.</b>
<b>10. References .....</b>	<b>Error! Bookmark not defined.</b>
<b>11. Article.....</b>	<b>Error! Bookmark not defined.</b>