

Contents

Chapter-1

Introduction

1.1	Nanotechnology	14-16
1.2	Nanomaterial	16
1.3	Nanoparticles	17
1.4	Nano-catalysis as a tool for green chemistry	17-18
1.5	Magnetic Nanoparticle 1.5.1 Magnetic Nanoparticle (Iron Oxide Fe₃O₄) as a catalyst: 1.5.2 Synthesis Methods of Magnetic Nanoparticle (MNPs) 1.5.2.1 Physical Synthesis of Magnetic Nanoparticle (MNPs) 1.5.2.2 Biological Synthesis of Magnetic Nanoparticle (MNPs) 1.5.2.3 Chemical Synthesis of Magnetic Nanoparticle (MNPs) 1.5.2.3.1 Thermal decomposition method 1.5.2.3.2 Micro-emulsion synthesis method 1.5.2.3.3 Hydrothermal (solvothermal) synthesis method 1.5.2.3.4 Sol-Gel synthesis method 1.5.2.3.5 Co-precipitation method	18-26
1.6	References	27-29

Chapter-2

Synthesis and Characterization of Amino acid capped transition metal ion doped iron oxide nanoparticles

2.1	Introduction	30-34
2.2	Experimental 2.2.1 Synthesis of L-arginine capped magnetic nanoparticles (Fe ₃ O ₄ @L-Arg NPs) 2.2.2 Materials	34-36
2.3	Result and discussion 2.3.1 Structure and morphology elucidation 2.3.2 Crystal structure of Fe ₃ O ₄ 2.3.3 Powder X-ray Diffraction(PXRD) 2.3.4 High-Resolution Transmission Electron Microscopy (HRTEM) analysis 2.3.5 VSM analysis 2.3.6 Mössbauer Spectroscopy 2.3.7 Thermal analysis:	36-40
2.4	Conclusion	40-52
2.5	Characterization 2.5.1 FTIR Spectroscopy: 2.5.2 Powder XRD Study(FWHM) 2.5.3 Energy-dispersive X-ray Analysis (EDAX)	53
2.6	References	54-57

Chapter-3

Amino acid-capped transition metal ion-doped iron oxide nanoparticles: evaluating drug delivery carrier efficiency and in vitro magnetic resonance image contrasting ability

3.1	Introduction	58-67
3.2	Experimental 3.2.1 Materials 3.2.2 Synthesis of brigatinib-loaded Fe₃O₄@ L-Arg/P magnetic micelles (Fe₃O₄@L-Arg/P/bg)	67-68
3.3	Results and Discussion 3.3.1 Phantom study 3.3.2 MRI Study	68-72
3.4	Discussion	73-75
3.5	In vitro drug release kinetics, cell-viability, and cytotoxicity studies 3.5.1 In Vitro drug release kinetic study 3.5.2 Cytotoxicity Study 3.5.3 Clonogenic Assay	75-79
3.6	Conclusion	79
3.7	Characterization 3.7.1 Calculation of drug loaded nanoparticles 3.7.2 Phantom study 3.7.3 MRI study 3.7.4 In vitro study design	80-82

	3.7.5 In vitro drug release kinetics 3.7.6 In vitro cytotoxicity test 3.7.7 Clonogenic assay	
3.8	References	83-82

Chapter-4

Synthesis of Fe₃O₄ Nanoparticles Using Different Amino Acid Molecules as Templates, Their Characterization and Applications as Vehicle for Drug Delivery

4.1	Introduction	86-90
4.2	Experimental 4.2.1 Materials 4.2.2. Synthesis of Fe₃O₄/AA NPs	90-92
4.3	Characterization of synthesized Fe₃O₄/AA NPs.	92-93
4.4	Results and Discussion	93-106
4.5	<i>In vitro</i> drug release kinetics, cell viability and cytotoxicity studies 4.5.1. <i>In vitro</i> drug release kinetics 4.5.2. Clonogenic Assay 4.5.3. <i>In Vitro</i> Cytotoxicity Assay	106-115
4.6	Conclusion	116

4.7	References	117-118
-----	------------	---------

Chapter-5

Fe₃O₄@L-Arginine and Fe₃O₄@L-Histidine Nanoparticles for One pot Solvent-free Sequential Knoevenagel-Michael Addition Reactions

5.1	Introduction	119-122
5.2	Experimental 5.2.1 Materials 5.2.2 Synthesis of Fe ₃ O ₄ @AA NPs 5.2.3 General procedure for the Knoevenagel condensation reaction 5.2.4 General procedure for the Michael addition reaction 5.2.5 General procedure for sequential Knoevenagel and Michael addition reaction 5.2.6 General procedure for the recovery of catalyst for sequential Knoevenagel–Michael addition reaction	122-124
5.3	Results and Discussion	124-129
5.4	Optimization of reaction parameters for model Knoevenagel condensation reaction	129-136
5.5	Recovery and recycling of Fe ₃ O ₄ @L-arginine and Fe ₃ O ₄ @L-histidine NPs	136-137

5.6	Origin of reactivity	136-140
5.7	Conclusion	141
5.8	Characterization	142-168
5.9	References	169-171