

Table of Contents

Synopsis	1
List of Publications	8
List of Figures	10
List of Tables.....	15
CHAPTER 1.....	16
1 INTRODUCTION.....	16
1.1 Introduction and historical background.....	16
1.2 Properties of nanoparticles	18
1.3 Biomedical Applications	18
1.4 Silica NP and their applications:	21
1.4.1 Organically modified silica (ORMOSIL) nanoparticles.....	23
1.5 Metal NPs	26
1.5.1 Gold NPs	28
1.5.2 Gold nanorods and Photothermal processes.....	29
1.6 Excited state processes	32
1.7 Experimental plan.....	36
1.8 Outline of the thesis.....	38
CHAPTER 2.....	40
2 EXPERIMENTAL DETAILS	40
2.1 Synthesis of NPs.....	40
2.1.1 ORMOSIL NP (SiNP-V, SiNP-VA).....	40
2.1.2 Gold Nanorods	42
2.1.3 Polymeric ((poly(lactic- <i>co</i> -glycolic) acid (PLGA)) NP.....	43
2.1.4 Liposomes	44
2.2 Characterization of NPs.....	44
2.2.1 Transmission Electron Microscopy	44
2.2.2 Hydrodynamic radius measurement.....	47
2.2.3 Zeta potential measurements.....	48
2.2.4 FTIR spectroscopy	50

2.3	UV-visible spectroscopy	54
2.3.1	Absorption spectroscopy	54
2.3.2	Emission spectroscopy	54
2.3.3	Fluorescence lifetime measurement	54
2.4	MTT Assay, to determine the cell survival	57
2.5	Molarity calculation of the NPs.....	57
2.6	Conclusion.....	58
CHAPTER 3.....		59
3	PHOTOPHYSICAL STUDIES ON THE INTERACTION OF ANS, TNS & MC540 WITH ORMOSIL NANOPARTICLES	59
3.1	Introduction	59
3.2	Experimental Methodology	62
3.3	Results and Discussion	63
3.3.1	Spectroscopic studies of ANS and TNS with SiNP-V and SiNP-VA	64
3.3.2	Spectroscopic studies of MC540 with SiNP-VA.....	71
3.3.3	Light induced photostability and phototoxicity of MC540 and its SiNP complex	74
3.4	Conclusion.....	76
CHAPTER 4.....		77
4	INTERACTION OF CHLORIN P₆ WITH SiNP-VA: PHOTOPHYSICAL AND PHOBIOLOGICAL STUDIES	77
4.1	Introduction	78
4.2	Experimental Details	80
4.3	Results	83
4.3.1	Effect of SiNP on the absorption and emission of Cp ₆ from pH 8.0 to 3.0... ..	83
4.3.2	FCS studies of the free Cp ₆ and Cp ₆ -SiNP complex.....	90
4.3.3	Intracellular uptake, localization and phototoxicity of free Cp ₆ and its SiNP complex	91
4.3.4	Relative photo-stability of the free Cp ₆ and Cp ₆ -SiNP complex	93
4.4	Discussion	94
4.5	Conclusion.....	99

CHAPTER 5.....	101
5 SPECTROSCOPIC INVESTIGATION OF CONVERSION OF PURPURIN 18 TO CHLORIN P₆ IN THE PRESENCE OF SILICA, LIPOSOME & POLYMERIC NPs	101
5.1 Introduction	102
5.2 Experimental details	104
5.3 Results and Discussion	105
5.4 Conclusion.....	112
CHAPTER 6.....	117
6 SPECTROSCOPIC STUDIES ON METHYLENE BLUE AND NILE BLUE BOUND TO COATED GOLD NANORODS	117
6.1 Introduction	118
6.2 Experimental Details	118
6.2.1 Absorption & Fluorescence spectroscopy.....	119
6.3 Results	120
6.3.1 Absorption properties of dye-AuNR systems	121
6.3.2 Fluorescence properties of the dye-AuNR systems	124
6.4 Discussion	128
6.5 Conclusion.....	132
CHAPTER 7.....	133
7 PHOTOPHYSICAL PROPERTIES OF CHLORIN P₆ BOUND TO COATED GOLD NANORODS.....	133
7.1 Introduction	133
7.2 Experimental Details	135
7.3 Results	136
7.4 Discussion	141
7.5 Conclusion.....	143
CHAPTER 8.....	145
8 CONCLUSION.....	145
REFERENCES	149