NATIONAL INSTITUTE OF LASER ENHANCED SCIENCES

المعهد القومى لعلوم الليزر

جامعة القاهرة

Thesis

Biological Application of Laser Technology Using Metallic Nanoparticles

Submitted in partial fulfillment of the requirements for
The Master of Science degree

In

Laser Science and interactions

By

Mohammed Tharwat Hassan
BSc in chemistry –Cairo University

National Institute of Laser Enhanced Science (N.I.L.E.S)
Cairo University
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Approval Sheet

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Mohammed Tharwat Hassan

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Ag NWs	Silver nanowires
ATCC	American Type Culture Collection
Au-NPs	Gold nanoparticles
DLS	Dynamic light scattering
DMBA	7,12-dimethylbenz α-anthracene
EM	Electromagnetic
EPR	Enhanced permeability and retention
FAD	Flavin adenine dinucleotide
FMN	Flavin mononucleotide
GGT	Gamma glutamyl transpeptidase
GNPs	Gold nanoparticles
GNPI	Gold nanoparticles which prepared chemically
GNPIV	Gold nanoparticles which prepared Cassia glauca
GNPII	Gold nanoparticles which prepared by Neem
GNPIII	Gold nanoparticles which prepared by Vitex trifolia L
GPx	Glutathione peroxidase
GSH	Lipid peroxidation, glutathione
GST	Glutathione S-transferase
IC_{50}	The concentration of thioglycoside compound required to produce 50% inhibition of cell(growth) were calculated using sigmoidal dose response curve-fitting model
LIFS	Laser Induced Fluorescence Spectroscopy
LIFS	Laser Induced Fluorescence Spectroscopy
LSPR	Localized surface plasmon resonance
Me-NPs	Metal nanoparticles

mM	Mile mole
MRI	Magnetic resonance imaging
NADH	Nicotinamide adenine dinucleotide
NIR	Infrared Region
Nm	Nano meter
Nps	Nanoparticles
NSL	Nanosphere lithography
PL	Photoluminescence
S.C	Sub continuous injection
SERS	Surface-enhanced Raman scattering
SP	Surface Plasmon
SPR	Surface plasmon resonance
SRB	Sulfo-Rhodamine-B
TEM	Transmission Electronic Microscope
UV–VIS	Ultra violet and visible absorption spectroscopy

Index of symbols

a	is the radius of the metallic nanosphere
Ag	Silver element
Ag+	Silver ion
Au	Gold element
Au^3+	Gold ion
BHK	fibroblast cell line
E	electric field
E(λ)	is the extinction of nanoparticles
$HAuCl_4$	chloroauric acid
HCT116	Colon carcinoma cell line
HELA	cervix carcinoma cell line
HEPG2	Liver carcinoma cell line
MCF7	breast carcinoma cell line
N_A	is the a real density of nanoparticles
$NaBH_4$	Sodium borohydride
P	the electric field-induced dipole moment
S	Thiol
U251	brain tumor cell line
α	molecular polarizability
ε_i	is the imaginary portion of the metallic nanosphere's dielectric function
ε_m	is the dielectric constant of the medium surrounding the metallic nanospher
ε_r	is the real portion of the metallic nanosphere's dielectric function
λ	is the wavelength of the absorbing radiation

Chapter I

Introduction