

**SURFACE-MODIFIED ZINC OXIDE  
NANOPARTICLES AND THEIR BIOACTIVITY  
TOWARDS HELA CELL LINES, ESCHERICHIA  
COLI AND SHIGELLA FLEXNERI**

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**UNIVERSITI SAINS MALAYSIA**

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TOWARDS HELA CELL LINES, ESCHERICHIA  
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by

**AMNA HASSAN SIRELKHATIM**

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## LIST OF SYMBOLS

A	Absolute
a	Basal plane constant
b	Path length
c	Speed of light
c	Uniaxial lattice constant
D	Grain size
$D_p$	Diffusion coefficient
d	Lattice plane distance
G	Surface conductance
e	Molar absorptivity
hkl	Miller indices
h	Planck's constant
I	Intensity of beam
$m_e$	Electron mass
n	integer
n	Statistical n-trials
P	Hole concentration
$p$	Statistical $p$ -value
$R_s$	Recombination rate
s	Surface recombination velocity
T	Absolute temperature
x	Concentration

$\varepsilon_z$	Strain
$\theta$	Scattering angle
$\lambda$	Wavelength
$\nu$	Frequency
$\sigma$	Stress
$\tau$	Lifetime
$\omega$	Phonon frequency
$\zeta$ -potential	Electrokinetic potential in colloidal dispersions

## LIST OF MAJOR ABBREVIATIONS

CB	Conduction band
DMSO	Dimethyl sulfoxide
DNA	Deoxyribonucleic acid
EDS	Energy Dispersive Spectroscopy
<i>E.coli</i>	Escherichia coli
EFTEM	Energy-filtering Transmission Electron Microscopy
ESI	Electron spectroscopy imaging
eV	Electron volt
H <sub>2</sub> DCFDA	2-,7- dichlorodihydrofluorescein diacetate
FESEM	Field-emission Scanning Electron Microscopy
FTIR	Fourier Transform Infrared spectroscopy
FWHM	Full width at half maximum
IC <sub>50</sub>	Inhibitory concentration
I-V	Current voltage measurement
kb	Bromophenol blue and xylene cyanole dyes serves as visual aid to monitor the progress of migration in agarose gel electrophoresis.
KBr	Potassium bromide
keV	Kilo electron volt
LED	Light emitting diode
mL	Milliliter
NaCl	Sodium chloride
NBE	Near band-edge emission

O	Oxygen
OD	Optical density
PBS	Phosphate buffered solution
PCD	Programmed cell death (apoptosis)
PDT	Photodynamic therapy
pH	Potential of hydrogen ion
ROS	Reactive oxygen species
TAE	Tris-Acetate-EDTA
TBEA	Trypan blue exclusion assay
TE buffer	Tris- EDTA used to solubilize DNA and prevent its degradation.
TEM	Transmission Electron Microscopy
VB	Valence band
V <sub>o</sub>	Oxygen vacancy
UV	Ultraviolet
UVA	Ultraviolet-A
UV-vis	Ultraviolet Visible Spectroscopy
XRD	X-ray diffraction
Zn <sub>i</sub>	Zinc interstitial
Zn	Zinc
ZnO-NPs	Zinc oxide nanoparticles