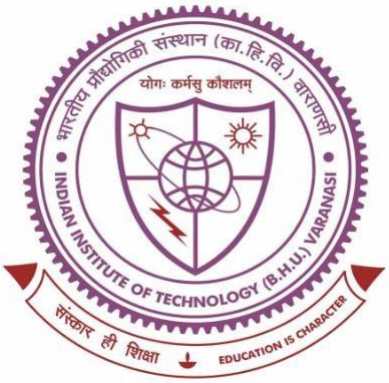
Interface Engineering of Functional Material Thin Films for Electronic and Optoelectronic Applications



THESIS SUBMITTED IN PARTIAL FULFILLMENT FOR THE AWARD OF DEGREE

Doctor of Philosophy

By

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It is certified that the work contained in the thesis titled ***"Interface Engineering of Functional Material Thin Films for Electronic and Optoelectronic Applications"*** by ***'Subhajit Jana'*** has been carried out under my supervision and that this work has not been submitted elsewhere for a degree.

It is further certified that the student has fulfilled all the requirements of comprehensive examination, candidacy and SOTA for the award of Ph.D. Degree.

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DECLARATION BY THE CANDIDATE

I, ***"Subhajit Jana"***, certify that the work embodied in this thesis is my own bonafide work and carried out by me under the supervision of ***"Prof. Rajiv Prakash"*** from ***"July 2017"*** to ***"November 2022"***, at the ***"School of Materials Science and Technology"***, Indian Institute of Technology (BHU), Varanasi. The matter embodied in this thesis has not been submitted for the award of any other degree/diploma. I declare that I have faithfully acknowledged and given credits to the research workers wherever their works have been cited in my work in this thesis. I further declare that I have not willfully copied any other's work, paragraphs, text, data, results, *etc*., reported in journals, books, magazines, reports dissertations, theses, *etc*., or available at websites and have not included them in this thesis and have not cited as my own work.

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"When you want something you've never had, you have to do something you've never done."

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LIST OF ABBREVIATIONS

µA	:	Microampere
µL	:	Microlitre
ºC	:	Degree Celsius
1D	:	One dimensional
2D	:	Two dimensional
3D	:	Three dimensional
AFM	:	Atomic Force Microscopy
Al	:	Aluminum
Au	:	Gold
cm	:	Centimeter
CV	:	Cyclic Voltammetry
DI	:	Deionized
EDS/ EDAX	:	Energy dispersive X-ray spectroscopy
eV	:	Electron volt
FTIR	:	Fourier transform infrared
FTM	:	Floating Film Transfer method
HOMO	:	Highest Occupied Molecular Orbital
h / hr	:	Hour(s)
HR-TEM	:	High resolution transmission electron microscopy
ITO	:	Indium Tin Oxide
LS	:	Langmuir Schaefer
LUMO	:	Lowest Unoccupied Molecular Orbital
Min	:	Minute(s)
M_W	:	Weight average molecular weight
Mn	:	Number average molecular weight
nm	:	nanometer

LIST OF ABBREVIATIONS

OFET	:	Organic Field Effect Transistor
OPT	:	Organic phototransistor
PDI	:	Polydispersive index
P3HT	:	Poly(3-hexylthiophene-2,5-diyl)
PBTTT	:	Poly[2,5-bis (3- tetradecylthiophen-2-yl) thieno[3,2- b]thiophene]
PQT	:	Poly(3,3‴-didodecyl[2,2′:5′,2″:5″,2‴-quaterthiophene]-5,5‴- diyl)
PT	:	Polythiophene
rr-P3HT	:	Regioregular- poly(3-hexylthiophene-2,5-diyl)
s	:	Second
SAED	:	Selected area electron diffraction patttern
T	:	Temperature
TBAP	:	Tetrabutyl ammonium perchlorate
TEM	:	Transmission electron microscopy
UV–Vis	:	UV Visible
V	:	Volt
XPS	:	X–ray photoelectron spectroscopy