

DECLARATION

I, hereby, declare that the thesis entitled “*Design of smartphone-based analytical tools for detection and analysis of chemicals, heavy metals and biological contaminants in water*”, submitted to the School of Sciences, Tezpur University (TU), in partial fulfillment of the requirements for the award of the Doctor of Philosophy in Physics, has been carried out by me at the Department of Physics, TU, Assam, India-784028, under the supervision of ***Prof. Pabitra Nath***. The contents of this work is original except where specific reference is made to the works of others and has not been submitted in whole or in part for consideration for any other degree or qualification in this or any other University or institute.

Diganta Hatiboruah

Date



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(A central University established by an Act of Parliament)

DEPARTMENT OF PHYSICS

Tezpur-784028, Assam, India

CERTIFICATE OF THE PRINCIPAL SUPERVISOR

This is to certify that the thesis entitled “*Design of smartphone-based analytical tools for detection and analysis of chemicals, heavy metals and biological contaminants in water*”, submitted to the School of Sciences, Tezpur University in partial fulfillment for the award of degree of Doctor of Philosophy in Physics, is a record of research work carried out by **Mr. Diganta Hatiboruah** under my guidance and supervision.

All kinds of support received by him from various sources have been duly acknowledged. No part of this thesis has been submitted elsewhere for award of any other degree.

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CERTIFICATE OF THE EXTERNAL EXAMINER

This is to certify that the thesis entitled “*Design of smartphone-based analytical tools for detection and analysis of chemicals, heavy metals and biological contaminants in water*”, submitted by Diganta Hatiboruah to the School of Sciences, Tezpur University in partial fulfillment for the award of degree of Doctor of Philosophy in Physics, has been examined by us on/...../..... and found to be satisfactory.

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ACKNOWLEDGMENT

This work is not just the output of my understanding of the subject but the outcome of the advice, guidance, encouragement, cooperation and support of many individuals, including my parents, family, friends and well-wishers. Herein I take an opportunity to express my heartfelt gratitude to everyone who have directly or indirectly contributed and helped me through with the successful completion of this journey.

At the onset, I deem it a privilege to express my deep sense of gratitude and heartfelt thanks to my research supervisor ***Prof. Pabitra Nath***, Department of Physics, Tezpur University. I am highly grateful for his encouragement, invaluable guidance and constant supervision from the beginning to the end of this research work. His dynamic personality, insightful nature and a positive approach towards life had a great deal of impact on my life and life-choices.

I wish to express my appreciation and thanks to my DC members ***Prof. Gazi A. Ahmed*** and ***Dr. Nima D. Namsa*** for their guidance, support and suggestions from time to time without whom this thesis would have not seen the light of the day.

I express my gratitude to all the faculty members, research scholars, seniors and juniors of the entire Department of Physics, all the technical and non-technical staffs of Tezpur University (TU) fraternity for their unprecedented help. I am thankful to ***Prof. Mrinal Kumar Das***, HoD, Department of Physics and ***Prof. Nilakshi Das*** (former HoD, Department of Physics) for their support in the department in any circumstances. I owe special gratitude to ***Prof. Vinod Kumar Jain***, Vice-Chancellor, Tezpur University for giving me the opportunity and facility to carry out my research work smoothly inside the campus. I acknowledge BIRAC-SRISTI, New Delhi and Tezpur University (Research and Innovation Grant), for providing the necessary financial help during the PhD period.

At this juncture, it is pertinent to acknowledge ***Prof. A. Pradhan***, Department of Photonics, IIT Kanpur; ***Dr. U. Bora*** and ***Dr. P. Bharali***, Department of Chemistry, Tezpur University; ***Prof. S. K. Ray*** and ***Prof. M. Mandal***, Department of Molecular Biology and Biotechnology, Tezpur University; ***Dr. K. U. Ahmed*** and ***Mr. P. Kalita***, Department of Civil Engineering, Tezpur University; ***Prof. P. Misra***, Department of Food Engineering and Technology, Tezpur

University and **Prof. D. Deka**, Department of Energy, Tezpur University. I am grateful for their suggestions, guidance and availability round the clock to help me out always. Also to mention **Shivam, Monica, Dama Di, Porag Da, Doljit Da** for collaborating with me at various stages of my doctoral research carrier. I would like to thank each and one of them for their incessant help and support during this journey.

I wholeheartedly thank my lab mates **Sibashis Da, Iftak Da, Naba Da, Rabha, Sritam, Priyanka, Deepjyoti, Biprav and Rupam** for their constant encouragement and cooperation and for making this journey a pleasant one. Also to mention **Narayan Da, Patir Da, Ratan Da, Ripu Da** from Department of Physics, who were always there in times of need.

I consider myself lucky to have warm-hearted friends and seniors like **Biswa Da, Rocket Da, Debasish da, Bichitra Da, Ankur Da, Animesh Da, Sudorshon Da, Ansuman Da, Niran, Olog, Tonmoy, Prankrisno, Sukla, Nandy, Rituporno, Aftab, Lavina, Nayana, Jatin, Boisyo, Prabhakar, Bhowel, Sudhangshu, Suku, Hiya, Nimi, Prantika, Debango, Debabrat, Bijoy, Nishant, Bishal**. I am extremely thankful to them for giving me a helping hand always.

A special thanks to **Tapu, Malua, Babu, Abhisekh, Dipankar, Dikshi (puali), Gori and Pori** for accepting nothing less than excellence from me and for staying with me in my toughest times, who were always there for me whenever I needed them. This would not have been possible without their love, support and constant motivation.

I convey my deepest acknowledgement to my pillars of strength - my family - **Mr. Kanak Hatiboruah (Deuta)** and **Mrs. Prity Hatiboruah (Maa)** whose blessings have brought me closer to all the joys of my life. I am grateful to my elder sisters **Sikha Hatiboruah (mainu)**, **Pinky Hatiboruah (maini)**, my dearest nephew **Ton** for their impassioned love and unfailing support.

I am grateful to the Almighty for providing me this life to accomplish this phase in my lifetime and to meet all the wonderful people acknowledged above.

(Diganta Hatiboruah)

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List of abbreviations

AAS	Atomic Absorption spectroscopy
AFS	Atomic Fluorescence Spectroscopy
ALS	Ambient Light Sensor
AMOLED	Active-Matrix Organic Light-Emitting-Diode
AuNP	Gold Nano-particles
BF	Bright-field
BIS	Bureau of Indian Standards
BL	Ball Lens
CAD	Computer-Aided Design
CCD	Charge-Coupled Devices
CFA	Color Filter Array
CFU	Colony Forming Unit
CMOS	Complementary Metal-Oxide Semiconductor
CPU	Central Processing Unit
CT	Computed Tomography
ELISA	Enzyme-Linked Immunosorbent Assay
EMR	Electro Magnetic Radiation
FDM	Fused Deposition Modeling
FRET	Fluorescence Resonance Energy Transfer
FWHM	Full Width Half Maximum
GPU	Graphics Processing Unit
GUI	Graphical User Interface
HPLC	High-Performance Liquid Chromatography
IF	Infrared Filter
IR	Infrared
LCD	Liquid Crystal Displays
LED	Light Emitting Diode
LSPR	Localized Surface Plasmon Resonance
MRI	Magnetic Resonance Imaging
MS	Mass Spectroscopy
MTCC	Microbial Type Culture Collection
MTF	Modulation Transfer Function
NA	Numerical Aperture

NTU	Nephelometric Turbidity Unit
OD	Optical Density
OS	Operating System
OTG	On-The-Go
PCX	Plano Convex
PIC	Photonic Integrated Circuit
PLA	Poly lactide Acid
PoC	Point-of-Care
RAM	Random Access Memory
ROM	Read-Only Memory
rpm	Rotations per minute
SOP	Standard Operating Protocol
SPR	Surface Plasmon Resonance
TCC	Total Cell Count
UI	User Interface
USAF	United State Air Force
USB	Universal Serial Bus
US-EPA	United State-Environmental Protection Agency
UV-VIS	Ultra Violet Visible
VCC	Viable Cell Count
WHO	World Health Organization

Dedicated to
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Mainu-Maini-Ton