Dedicated to My Beloved
Parents
Mr. Madhusudan Dhua & Mrs. Shikha Dhua
My Wife
Mrs. Puja Rakshit
and
My Supervisor
Prof. Poonam Mishra

Declaration by the Candidate

The candidate certifies that the thesis entitled "**Development of multiresponsive carbon dots based aerogel and its application in food analysis**" submitted to the ***School of Engineering, Tezpur University*** in partial fulfilment for the award of the degree of ***Doctor of Philosophy*** in the ***Department of Food Engineering and Technology*** is a record of research work carried out by me under the supervision of **Prof. Poonam Mishra**.

All assistance received from various sources have been duly acknowledged.
No part of this thesis has been submitted elsewhere for the award of any other degree.

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Date: 14/11/2025

Place: Tezpur University, Assam

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(Awardee of Visitor's Best University Award, 2016 and 5th among India's Top 100 Universities, MHRD-NIRF Ranking, 2016)

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Certificate of the Supervisor

This is to certify that the thesis entitled **"Development of multiresponsive carbon dots based aerogel and its application in food analysis"** submitted to the **School of Engineering**, Tezpur University in partial fulfillment for the award of the degree of Doctor of Philosophy in **Food Engineering and Technology** is a record of research work carried out by **Mr. Subhamoy Dhua** under my supervision and guidance.

All help 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.

Poonam Mishra.
Signature by Supervisor

Poonam Mishra

Date: 14/11/25

Place: Tezpur

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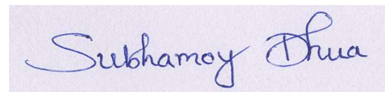

Subhamoy Dhua

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Abbreviations	Full Form
AA	Ascorbic Acid
AChE	Acetylcholinesterase Enzyme
AFM	Atomic Force Microscopy
AgNCs	Silver Nanoclusters
AgNPs	Silver Nanoparticles
ATCh	Acetylthiocholine
ATP	Adenosine Triphosphate
B	Blue Value
BD	Bulk Density
BET	Brunauer-Emmett-Teller
BPEI	Branched Polyethylenimine
BSM	Balangu seed mucilage
CDA	Carbon Dots based Aerogel
CDFA	Carbon Dots based Functional Aerogel
CDs	Carbon Dots
CI	Crystallinity Index
CMs	Carbon Microspheres
CNC	Cellulose Nano Crystals
CNF	Cellulose Nano Fibre
CQD	Carbon Quantum Dot
CV	Cyclic Voltammetry
D	Density
DDL	Diacetyldihydrolutidine
DE	Degree of Esterification
DMF	Dimethylformamide
DPPH	2,2-Diphenyl-1-Picrylhydrazyl
DSC	Differential Scanning Calorimetry
EDC	N-(3-Dimethylaminopropyl)-N′-Ethylcarbodiimide Hydrochloride
EDEA	2,2-(Ethylenedioxy)-bis-(Ethylamine)
EFSA	European Food Safety Authority
FA	Formalin

FD	Freeze Dried
FSSAI	Food Safety and Standard Authority of India
FT-IR	Fourier Transform Infrared Spectroscopy
G	Green Value
GA	Graphene Aerogel
GAE	Gallic Acid Equivalent
GCE	Glassy Carbon Electrode
GC-MS	Gas chromatography Mass Spectrometry
GO	Graphene Oxide
GRAS	Generally Recognized as Safe
HPLC	High Performance Liquid Chromatography
HRTEM	High-Resolution Transmission Electron Microscopy
IARC	International Agency for Research in Cancer
IBR	Intensity of Backscattered Radiation
IL	Ionic Liquid
IUPAC	International Union of Pure and Applied Chemistry
LED	Light Emitting Diode
LOD	Limit of Detection
LOQ	Limit of Quantification
MD	Microwave Dried
MPL	Maximum Permissible Limit
MTMS	Methyltrimethoxysilane
MW	Molecular Weight
NFC	Nanofibrillated Cellulose
NHS	N-Hydroxysuccinimide
NMMO	N-Methylmorpholine-N-Oxide
NMR	Nuclear Magnetic Resonance
OP	Organophosphate Pesticides
PCA	Principal Component Analysis
PDI	Polydispersity Index
PET	Photoinduced Electron Transfer
PL	Photo Luminescent
PMAA	Polymethacrylic Acid

PP	Polypropylene
PVA	Poly Vinyl Alcohol
QDs	Quantum Dots
QY	Quantum Yield
RLS	Resonance light scattering
RSD	Relative Standard Deviation
R^2	Coefficient of Determination
SAED	Single Area Diffraction
SC	Supercritical
SCD	Supercritical CO_2 Dried
SCE	Supercritical Extraction
SEM	scanning electron microscopy
SP	Soy Protein
SSA	Specific Surface Area
TBA	Tert-Butanol
TEM	Transmission Electron Microscopy
TEOS	Tetraethyl Orthosilicate
TMAO	Trimethylamine Oxide
TR	Tollens Reagent
TTA	Thenoyltrifluoroacetone
UV	Ultraviolet
VOC	Volatile Organic Compound
WAC	Water Absorption Capacity
WHO	World Health Organization
WLE	White Light Emitting
XRD	X-ray diffraction
YMBE	Yerba-Mate Based Extract
ε	Porosity