

## *Dedication*

*This thesis is proudly dedicated to my sweet and loving*

*Mother, Father, Brother and Wife*

*Whose affection, love and prayers make me able to get  
success and honour.*

*Doljit Borah*

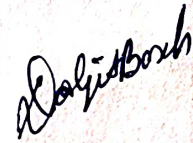
## Declaration

### ***DECLARATION***

I hereby declare that the thesis entitled "*Design and development of Photobioreactor for mass cultivation of microalgae to produce biofuel*" has been submitted to Tezpur University in the Department of Energy under the School of Engineering for partial fulfilment for the award of the degree of Doctor of Philosophy in Energy. This is an original work carried out by me. Further, I declare that no part of this work has been reproduced elsewhere for award of any other degree.

Date: 08.07.2024

Place: Tezpur University, Tezpur



(Doljit Borah)

Registration No.: TZ121790 of 2012



## Certificate



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

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Doljit Borah



**List of Figures****List of figures****Chapter 1**

<b>Figure</b>	<b>Title</b>	<b>Page No.</b>
1.1	The photosynthesis reaction	2
1.2	Global oil production	4
1.3	Global human population	4
1.4	Pie chart showing the percentage of different energy sources used globally and in India to fulfil its energy needs.	5
1.5	Concentration of Carbon dioxide in the air.	5
1.6	Annual CO <sub>2</sub> production.	6
1.7	A representation of the global energy scenario and different energy sources.	8
1.8	Primary biofuel production by country/region and fuel type, 2016-2022.	16
1.9	Some well documented microalgae species having commercial significance.	18
1.10	Microalgae biofuel technologies: various pathways and associated biofuels.	21
1.11 (a)	Schematic of a raceway pond system	23
1.11 (b)	Raceway pond system by Parry Nutraceuticals, India	23
1.11 (c)	Raceway pond system Atacama Bionatural at Atacama Desert.	23
1.12 (a)	<i>Chlorella</i> sp. grown by Sun Chlorella USA in a circular pond system.	24
1.12 (b)	1 <sup>st</sup> commercial <i>Chlorella</i> production in Japan, 1960	24
1.13 (a)	A stacked tubular photobioreactor	24
1.13 (b)	A spiral tubular photobioreactor	24
1.13 (c)	A horizontal tubular photobioreactor	24
1.14 (a)	A 1300 L capacity flat plate photobioreactor at CNR experimental area of Sesto Fiorentino (Firenze).	25
1.14 (b)	An experimental flat plate photobioreactor at UFRJ, Brazil.	25



## List of Figures

1.15 (a)	Cultivation of different algal species in bubble columns photobioreactor at Plymouth Marine Laboratory.	26
1.15 (b)	Different airlift photobioreactor designs.	26
1.16 (a)	Hanging bag type photobioreactor	28
1.16 (b)	A horizontal thin film bag photobioreactor	28
1.16 (c)	A vertical panel type bag photobioreactor	28
1.17 (a)	A descending thin-film photobioreactor at GreenTec laboratory, UFRJ, Brazil.	29
1.17 (b)	A cascading type thin film descending photobioreactor	29
1.17 (c)	An artificially illuminated thin film descending type photobioreactor.	29
1.18 (a)	A 1000 L capacity POFC-based internally illuminated microalgae culture system at GreenTec laboratory UFRJ, Brazil.	30
1.18 (b)	A Fresnel lens and infrared filter assembly collecting sunlight and transferring it to POFC.	30
1.18 (c)	POFC and air sparger assembly of the internally illuminated photobioreactor system.	30
<b>Chapter 3A</b>		
3A.1 (a)	Schematic model of Internally Illuminated Stirred Light Column Photobioreactor (IISLCP).	71
3A.1 (b)	Cross sectional view of the IISLCP model.	71
3A.2 (a)	Schematic of support for internal lighting and mixing system consist of a central revolving axel and LED support rings.	71
3A.2 (b)	Schematic of the support system with LED strips installed.	71
3A.3	Schematic of lighting and mixing assembly fixed to the external support system using bearing and housing assembly.	72
3A.4 (a)	Schematic of IISCLP gear assembly	73
3A.4 (b)	Schematic of the IISCLP LED connecting rings and graphite brush assembly.	73
3A.5 (a)	Internal lighting assembly, the gear assembly and the support structure of the developed IISCLP system.	74

## List of Figures

3A.5 (b)	The lighting assembly with LEDs powered ON of the IISCLP system.	74
3A.5 (c)	Top view of the interior of the culture tank and lighting assembly of the IISCLP system.	74
3A.6	Schematic of IIAP	75
3A.7 (a)	Schematic of the cross-sectional view of the IIAP.	75
3A.7 (b)	Schematic of LED strip arrangement of the IIAP	75
3A.8 (a)	Schematic of aerating ring of the IIAP in top isometric view.	76
3A.8 (b)	Schematic of LED strip arrangement of the IIAP in bottom isometric view.	76
3A.9 (a)	The external view of the developed IIAP system.	77
3A.9 (b)	Internal view of the developed IIAP system with LED strips and microalgae culture.	77
3A.10	IIAP control system developed using Arduino Uno microcontroller system.	78
3A.11	The control algorithm for the IIAP system, developed using Arduino Nano microcontroller board.	80
3A.12	Schematic model of Stacked Tray Automated Modular Photobioreactor (STAMP).	82
3A.13(a)	Schematic view of the microalgae culture tray (MCT).	82
3A.13(b)	Schematic view of the LED panel used to illuminate the MCTs.	82
3A.14	Schematic representation of the raiser mixer tank of the STAMP system along with the submersible water pump and the reciprocating air pump.	83
3A.15 (a)	65 L STAMP system developed at Biomass Conversion Laboratory, Department of Energy, Tezpur University.	84
3A.15 (b)	Internal view of a MCU and the LED panel of the developed STAMP system.	84
3A.15 (c)	Raiser mixer assembly of the developed STAMP system.	84
3A.15 (d)	Top view of STAMP system.	84
3A.15 (e)	Display panel of the developed STAMP control system.	84

## List of Figures

3A.16	Control algorithm of STAMP system, implemented using Arduino microcontroller system.	86
3A.17	Control system of the developed STAMP system	87
3A.18	The LED panel of the STAMP system with glass slides to monitor biofouling.	88
3A.19	<i>Chlorella homosphaera</i> microalgae strain viewed under compound microscope at $\times 40$ magnification.	89
3A.20 (a)	Hemocytometer	92
3A.20 (b)	Nebular chamber	92
3A.21	Microalgae culture filtered using glass microfilters for microalgae growth measurement using gravimetric method.	93
<b>Chapter 3B</b>		
3B.1	Four experimental setups, fitted with cool-white, pink, blue and red LED illuminations.	103
3B.2 (a)	Cardboard sheet cut into shape and dimension to build microalgae culture chamber (MCC).	104
3B.2 (b)	Cardboard cut for MCC lined with aluminium foil	104
3B.2 (c)	The MCC fitted with LED strips, sensors and accommodating four 500 mL capacity Erlenmeyer flasks.	104
3B.3	Flow chart of the developed control algorithm	106
3B.4	Arduino Nano based control circuit developed for the microalgae experimentation setup.	107
3B.5	Flow diagram of RSM based microalgae culture experimentation	108
3B.6 (a)	Front side of the Alicat Scientific mass flow meter used for air flow analysis.	109
3B.6 (b)	Rear side of the mass flow meter used.	109
<b>Chapter 3C</b>		
3C.1 (a)	Microalgae harvesting setup of 100 L harvesting capacity.	114
3C.1 (b)	Top view of the harvesting 100 L microalgae culture setup.	114
3C.1 (c)	Adding ferric chloride solution for microalgae harvesting.	114

## List of Figures

---

### Chapter 4A

4A.1 (a)	The internal illumination system of the IISCLP system consisting the LED strips, support rings and the central axel, in an illuminated state.	127
4A.1 (b)	The internal illumination system of the IISCLP system along with the support structure and gear and motor assembly.	127
4A.2	Microalgae growth and pH of the microalgae culture, grown in the IISCLP system monitored for 7 days.	128
4A.3 (a)	The POFC based photobioreactor developed and placed at the terrace of GreenTec Laboratory, UFRJ, Brazil.	130
4A.3 (b)	The Fresnel lens, IR filter and the POFC cables assembly with the solar tracker system.	130
4A.3 (c)	The illuminated POFC cables dispersing light from its tips.	130
4A.3 (d)	The POFC assembly with its support structure of the developed photobioreactor.	130
4A.4	Temperature control achieved using Arduino based control system in the IIAP system.	132
4A.5	Effect of biofouling on the LED strips used in the IISCLP and IIAP systems.	133
4A.6 (a)	Biofouling in tubular photobioreactor as reported by Arbiba et al.	133
4A.6 (b)	Biofouling in flat plate air lift photobioreactor system reported by Li et al.	133
4A.7	Schematic representation of different types of photobioreactors commonly used for microalgae cultivation.	134
4A.8	Schematic view of the Stacked tray automated modular photobioreactor (STAMP) system.	136
4A.9	Growth analysis of <i>C. homosphaera</i> microalgae species grown in the STAMP system.	137
4A.10	Measurement of transmissivity of the glass slides placed on the surface of the LED panels facing the microalgae culture in the STAMP system.	138



## List of Figures

---

4A.11	Temperature variation caused by the LED illumination in the developed STAMP system.	139
<b>Chapter 4B</b>		
4B.1 (a)	Light spectrum of the LEDs measured using Compact CCD Spectrometer for Cool-white LED.	144
4B.1 (b)	Warm white LED	144
4B.1 (c)	Pink LED	144
4B.1 (d)	Blue LED	144
4B.1 (e)	Red LED	144
4B.1 (f)	Green LED	144
4B.2	Light intensity of the LEDs measured using Apogee MQ-510 full spectrum quantum sensor for Cool-white, Pink, Blue and Red LEDs installed in the microalgae culture experimental setup.	145
4B.3(a-f)	Effect of different parameters on the biomass growth cultured using Cool-white LED illumination.	149
4B.4 (a-f)	Effect of different parameters on the biomass growth cultured using Pink LED illumination.	149
4B.5(a-f)	Effect of different parameters on the biomass growth cultured using Blue LED illumination.	150
4B.6(a-f)	Effect of different parameters on the biomass growth cultured using Red LED illumination.	150
4B.7(a-f)	Effect of different parameters on the lipid production for microalgae cultured using Cool-white LED illumination.	154
4B.8(a-f)	Effect of different parameters on the lipid production for microalgae cultured using Pink LED illumination.	154
4B.9(a-f)	Effect of different parameters on the lipid production for microalgae cultured using Blue LED illumination.	155
4B.10(a-f)	Effect of different parameters on the lipid production for microalgae cultured using Red LED illumination	155

## List of Figures

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### Chapter 4C

4C.1	Calorific value of dry microalgae biomass and deoiled microalgae biomass culture from the STAMP system using cool-white and pink LED illumination.	168
4C.2	Ash content of dry microalgae biomass and deoiled microalgae biomass culture from the STAMP system using cool-white and pink LED illumination	169
4C.3 (a)	$^1\text{H}$ NMR spectra of <i>C homosphaera</i> microalgae lipid cultured with pink LED illumination in the STAMP system.	172
4C.3 (b)	$^1\text{H}$ NMR spectra of <i>C homosphaera</i> microalgae biodiesel derived from the pink LED illumination microalgae cultured in the STAMP system.	173

## List of Tables

<b>Table</b>	<b>Title</b>	<b>Page No.</b>
<b>Chapter 1</b>		
1.1	Some of the prominent renewable energy technologies available at present.	9-11
1.2	Biodiesel feedstock and their productivity	19
1.3	Microalgae species with high lipid content	20
<b>Chapter 2</b>		
2.1	Prominent large scale microalgae culture systems, their advantages and disadvantages	44-45
<b>Chapter 3A</b>		
3A.1	Chemical composition of Blue Green 11 (BG-11) culture media.	90
<b>Chapter 3B</b>		
3B.1	Actual and coded values of the independent variables of C. homosphaera	100
3B.2	Four-factor FCCCD based experimental design	101
<b>Chapter 4B</b>		
4B.1	ANOVA analysis of biomass production using the four LED illuminations	148
4B.2	Predicted and experimental results of biomass productivity obtained in the RSM	151
4B.3	ANOVA analysis of lipid production using the four LED illuminations	153
4B.4	Predicted and experimental results of lipid productivity obtained in the RSM experiments	156
4B.5	Biomass and lipid content obtained using optimized conditions and normal conditions.	161
<b>Chapter 4C</b>		
4C.1	Composition of the C homosphaera microalgae lipid analysed using GCMS.	171
4C.2	Characterization of the biodiesel derived from pink illuminated C homosphaera microalgae cultivated in the STAMP	174

## List of Schemes

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### List of schemes

<b>Scheme</b>	<b>Title</b>	<b>Page No.</b>
<b>Chapter 1</b>		
1.1	Fermentation reaction	13
1.2	Transesterification reaction	13



## List of Abbreviations

# LIST OF ABBREVIATIONS

Abbreviation	Full form
<sup>1</sup> HNMR	Proton nuclear magnetic resonance
ACS	American Chemical Society
ANOVA	Analysis of Variance
ASTM	American Society for Testing and Materials
BG11	Blue Green Media
CCD	Central Composite Design
CO <sub>2</sub>	Carbon Dioxide
COP21	United Nations Climate Change Conference, Paris, 2015
COP26	United Nations Climate Change Conference, Glasgow, 2021
CV	Calorific Value
DBT	Department of Biotechnology
DC	Direct Current
DCW	Dry Cell Weight
DOE	Design of Experiments
DOI	Digital Object Identifier
EEPROM	Electrically Erasable Programmable Read-Only Memory
EN	European Union Standards
FAME	Fatty Acid Methyl Ester
FCCCD	Face Cantered Central Composite Design
GC-MS	Gas chromatography-Mass spectrometry
GPR	Gaussian Process Regression
IDE	Integrated Development Environment
IIAP	Internally Illuminated Airlift Photobioreactor
IISCLP	Internally Illuminated Stirred Light Column Photobioreactor
IR	Infrared
LED	Light Emitting Diode
LCD	Liquid Crystal Display

## List of Abbreviations

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MCC	Microalgae Culture Chamber
MCT	Microalgae Culture Trays
MoSFET	Metal-Oxide Semiconductor Field Effect Transistor
MS	Mild Steel
NTP	Normal Temperature and Pressure
OD	Optical Density
OD <sub>560</sub>	Optical Density at 560 nm wavelength
PBR	Photobioreactor
pH	Potential of Hydrogen
POFC	Plastic Optical Fibre Cables
PVC	Polyvinyl chloride
RSM	Response Surface Methodology
RTC	Real-Time Clock
SAF	Sustainable Aviation Fuel
SD	Secure Digital
SPSS	Statistical Package for Social Sciences
STAMP	Stacked Tray Automated Modular Photobioreactor
TS-300B	Turbidity Sensor 300b
UFRJ	Federal University Of Rio De Janeiro
UN	United Nation
US	United States
UV	Ultraviolet