Dedicated to.....
Late Uncle Mullugeta Fuchamo

Declaration of Academic Integrity

I declare that this written submission represents my ideas in my own words and where other's ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty, integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be caused for disciplinary action as per the rules and regulations of the Institute.

Due acknowledgement to all the related data used from different sources in order to support my research findings have been made wherever necessary. All funding agencies have been duly acknowledged for providing research grants to carry out my research work smoothly.

Date: 14-08-2023 (**Mr. Tamrat Yimenu Zeleke**)

Place: Tezpur University TZ203943 of 2023

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CERTIFICATE FROM SUPERVISOR

This is to certify that the thesis entitled "***Multicomponent Crystals of Famotidine and Trimethoprim as Improved Pharmaceutical Materials: Design, Characterization, and Properties***" submitted to the School of Sciences, Tezpur University in partial fulfilment for the award of the degree of Doctor of Philosophy in Chemical Sciences is a record of research work carried out by **Mr. Tamrat Yimenu Zeleke** under my supervision and guidance. He has been duly registered (Registration No. TZ203943 of 2023), and the thesis presented is worthy of being considered for the Degree of Doctor of Philosophy.

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.

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CERTIFICATE OF THE EXTERNAL EXAMINER AND ODEC

This is to certify that the thesis entitled **"Multicomponent Crystals of Famotidine and Trimethoprim as Improved Pharmaceutical Materials: Design, Characterization, and Properties"** submitted by **Tamrat Yimenu Zeleke** to **Tezpur University** in the **Department of Chemical Sciences** under the **School of Sciences** in partial fulfilment for the award of the degree of Doctor of Philosophy in **Chemical Sciences** has been examined by us and found to be satisfactory.

The committee recommends for the award of the Degree of Doctor of Philosophy.

Signature of:

(Dr. Bipul Sarma)
Thesis Supervisor
Date:

External Examiner
Date:

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(Tamrat Yimenu Zeleke)

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Abbreviations and Symbols

A	Acceptor
Å	angstrom Acetonitrile
a.u.	Arbitrary unit
API	Pharmaceutical Ingredients
ABA	Aminobenzoic acid
ACN	Acetonitrile
A_u	Absorbance of the unknown solution
BCS	Biopharmaceutics Classification System
cm^{-1}	Per centimeter
°C	Degree Celsius
$°min^{-1}$	Degree Celsius per minute
Calc.	Calculated
cm	Centimeter
CSD	Cambridge Structural Database
C_u	Concentration of an unknown solution
D	Donor
1D	One dimensional
2D	Two dimensional
3D	Three dimensional
DFT	Density Functional Theory
DHBA	Dihydroxybenzoic acid
23-DHBA	2,3-dihydroxybenzoic acid
24-DHBA	2,4-dihydroxybenzoic acid
25-DHBA	2,5-dihydroxybenzoic acid
26-DHBA	2,6-dihydroxybenzoic acid
34-DHBA	3,4-dihydroxybenzoic acid
35-DHBA	3,5-dihydroxybenzoic acid
DSC	Differential scanning calorimetry
EtOH	Ethanol
FAM	Famotidine
FDA	Food and Drug Administration
FT-IR	Fourier-transform infrared spectroscopy
GRAS	Generally regarded as safe list
HBA	Hydroxybenzoic acid
h	Hours
HCl	Hydrochloric acid
$kJ\ mol^{-1}$	Kilojoules per mole

kcal mol^{-1}	kilocalorie per mole
KBr	Potassium bromide
m-ABA	*m*-Aminobenzoic acid
m-HBA	*m*-Hydroxybenzoic acid
μm	Micrometer
mg	Milligram
min	Minutes
mL	Milliliter
mm	Millimetre
g cm^{-3}	gram per centimeter cube
mmol	Millimolar
MeOH	Methanol
M.Pt.	Melting point
Obs.	Observed
o-ABA	*o*-Aminobenzoic acid
o-HBA	*o*-Hydroxybenzoic acid
p-ABA	*p*-Aminobenzoic acid
p-HBA	*p*-Hydroxybenzoic acid
PXRD	Powder X-ray diffraction
rpm	revolutions per minute
ss-NMR	solid-state nuclear magnetic resonance
TGA	Thermogravimetric analysis
UV	Ultraviolet
UV-vis	Ultraviolet-visible
TRM	Trimethoprim
X-RD	X-ray diffraction
XPS	X-ray photoelectron spectroscopy