



# Research & PG Department of Chemistry ST. THOMAS COLLEGE

(Autonomous)

THRISSUR - 680 001, KERALA, INDIA

Affiliated to the University of Calicut & NAAC Accredited with CGPA 3.70/4 at 'A++' Grade-4<sup>th</sup> Cycle  
Web:- <http://stthomas.ac.in> Email:- [stthrissur@gmail.com](mailto:stthrissur@gmail.com) Phone:-  
+91 487 2420435 Fax:- +91 487 2421510

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24-03-2023

## CERTIFICATE

This is to certify that the thesis entitled “**Self-Assembly of Cobalt, Copper and Molybdenum Based Hybrid Solids: Tuning Metal-Ligand Interactions Towards Properties**” is an authentic record of research work carried out by **Memsy C K** under my supervision in partial fulfillment of the requirements for the degree of Doctor of Philosophy, in Chemistry of University of Calicut and further that no part thereof has been presented before for any other degree.

**Dr. Jency Thomas**  
(Research Supervisor)

## **DECLARATION**

I hereby declare that the thesis entitled “**Self-Assembly of Cobalt, Copper and Molybdenum Based Hybrid Solids: Tuning Metal-Ligand Interactions Towards Properties**”, submitted to the University of Calicut in partial fulfillment of the requirements for the award of the Degree of Doctor of Philosophy in Chemistry is a bonafide research work done by me under the supervision and guidance of Dr. Jency Thomas, Assistant Professor, Research & PG Department of Chemistry, St. Thomas College (Autonomous), Thrissur, Kerala.

I further declare that this thesis has not previously formed the basis of any degree, diploma or any other similar title.

**Memsy C K**

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***“When you want something, all the universe conspires in helping you to achieve it.”***

**– Paulo Coelho**

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**Memsy C K**

*Dedicated to*

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## List of Abbreviations

APM	Ammonium phosphomolybdate
APS	Ammonium persulphate
ATR	Attenuated total reflection
CP	Coordination polymers
CTAB	Cetyltrimethylammonium bromide
de	Distance from a point on the surface to the nearest nucleus outside the surface
di	Distance from a point on the surface to the nearest nucleus inside the surface
$d_{\text{norm}}$	Normalized contact distance
DMF	Dimethyl formamide
DMSO	Dimethyl sulfoxide
DTA	Differential Thermal Analysis
$E_{\text{dis}}$	Dispersion energy
$E_{\text{ele}}$	Classical electrostatic energy
$E_{\text{pol}}$	Polarization energy
$E_{\text{rep}}$	Repulsion energy
E.Coli	Escherichia coli
EDAX	Energy dispersive X-ray spectroscopy
EY	Eosin Y
FP	Finger print

FESEM	Field emission scanning electron microscope
FTIR	Fourier Transform Infrared
HS	Hirshfeld surface
LMCT	Ligand to metal charge transfer
LBL	Layer by layer
MB	Methylene blue
MC	Metal complex
MEP	Molecular electrostatic potentials
MG	Malachite green
MO	Methyl orange
ORTEP	Oak ridge thermal ellipsoid plot
PMO	Phosphomolybdates
POM	Polyoxometalates
PXRD	Powder X-ray diffraction
$r_i^{vdw}$	Van der Waals radii of atoms present inside the 3-D Hirshfeld surface
$r_e^{vdw}$	Van der Waals radii of atoms present outside the 3-D Hirshfeld surface
SCXRD	Single crystal X-ray diffraction
TGA	Thermogravimetric analysis
TMC	Transition metal complex
UV-Vis	Ultraviolet-visible
UV-DRS	Ultraviolet-Diffuse reflectance spectroscopy
ZOI	Zone of inhibition
2-ampz	2-aminopyrazine

<i>2-ampy</i>	2-aminopyridine
<i>3-ampy</i>	3-aminopyridine
<i>4-ampy</i>	4-aminopyridine
<i>ampy</i>	aminopyridine
<i>Ppy</i>	Polypyrrole
<i>pz</i>	Pyrazole
1-D	One dimensional
2-D	Two dimensional
3-D	Three dimensional