FACULTY OF TEACHER TRAINING AND EDUCATION
UNIVERSITY OF BENGKULU

CERTIFICATE

THIS CERTIFICATE IS AWARDED TO

Dewi Handayani

as

Presenter

with the title

SINTESIS DAN KARAKTERISASI LANTANUM-METAL ORGANIC FRAMEWORKS DAN UJI POTENSINYA SEBAGAI SENSOR KATION-ANION LOGAM

at

THE FIRST INTERNATIONAL SCIENCE AND EDUCATION SUMMIT (1st ISES 2022)

"Transforming Science and Education on Emerging Digitalization Era"
Bengkulu, October 15th-16th 2022

DEAN OF FKIP UNIB

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Sains/Pendidikan Sains

1	Abdul Rahman Singkam*, Mustika Elmi Dayana, Inka Puspita, Monica Grevinda, Tri Nadia Agustin	PEMETAAN TINGKAT KESULITAN MATERI UN BIOLOGI SMA/MA PADA SETIAP INDIKATOR BERDASARKAN NILAI UN SMA/MA SE-PROVINSI BENGKULU TAHUN 2015-2019
2	Greska Ulandari	DESIGN AND CONSTRUCTION OF CO, CO2 AND CH4 HAZARDOUS GAS MONITORING EQUIPMENT BASED ON ARDUINO UNO AND GSM SIM 900A
3	Ahmad Syarkowi	Profile of the level of student satisfaction in carrying out online physics learning from a gender perspective
4	Wiwit *, Pratiwi Kiki Ramadhanti , Febrian Solikhin, Dewi Handayani	Development of a cognitive evaluation tool based on iSpring Suite 9 in Buffer Solution material
5	Sura Menda Ginting*, Dewi Handayani*, Rina Elvia*, Intan Dwi Lestari, Uli Rosidah	SINTESIS DAN KARAKTERISASI LANTANUM-METAL ORGANIC FRAMEWORKS DAN UJI POTENSINYA SEBAGAI SENSOR KATION-ANION LOGAM
6	Mat Rasid Ishak*, Hidayah Mohd Fadzil dan Harris Shah Abdul Hamid	Development and Evaluation of Science Teacher Readiness Inventory in Implementing Classroom-Based Assessment in Malaysia
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8	Tri Irama Setiadi*, Kasrina, dan Dewi Jumiarni	PENGEMBANGAN E-MODUL BIOLOGI BERBASIS FLIP PDF CORPORATE PADA MATERI KEANEKARAGAMAN HAYATI
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10	Desti Fitria R* , Dedy Hamdani , Desy Hanisa Putri	PENGEMBANGAN ALAT PENGUKUR DEBIT DAN VOLUME AIR BERBASIS ARDUINO UNO MENGGUNAKAN SENSOR FLOW YF-S401
11	Nurhamidah*, Dewi Handayani	PENGEMBANGAN SOFT SKILLS MAHASISWA MELALUI INTEGRASI PEMBELAJARAN STEM PJBL PADA TOPIK SENYAWA ORGANIK
12	Abdul Rahman Singkam, Mustika Elmi Dayana*, Inka Puspita, Monica Grevinda, Tri Nadia Agustin	PEMETAAN DAN IDENTIFIKASI SAMPAH DI WILAYAH UNIVERSITAS BENGKULU
13	Andang Wijanarko	Design and Development of Digital Game-Based Learning for High School Students in Chemistry Learning

Moderator: Abdul Rahman; Ahmad Syarkowi

***Presenter**

	Time
Universitas Bengkulu	13.30-13.40
Universitas Bengkulu	13.40-13.50
Universitas Bengkulu	13.50-14.00
Universitas Bengkulu	14.00-14.10
Universitas Bengkulu	14.10-14.20
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Universitas Bengkulu	14.30-15.40
Universitas Bengkulu	14.40-14.50
Universitas Bengkulu	14.50-15.00
Universitas Bengkulu	15.00-15.10
Universitas Bengkulu	15.10-15.20
Universitas Bengkulu	15.20-15.30
Universitas Bengkulu	15.30-15.40

SYNTHESIS AND CHARACTERIZATION OF LANTANUM-METAL ORGANIC FRAMEWORK AND THEIR POTENTIAL AS SENSOR FOR INORGANIC IONS

(The topic is part of Material Chemistry Course Taught in Year 3 students of Chemistry Education)

Sura Menda Ginting[1], Dewi Handayani[1], Rina Elvia[1], Intan Dwi Lestari, Uli Rosidah
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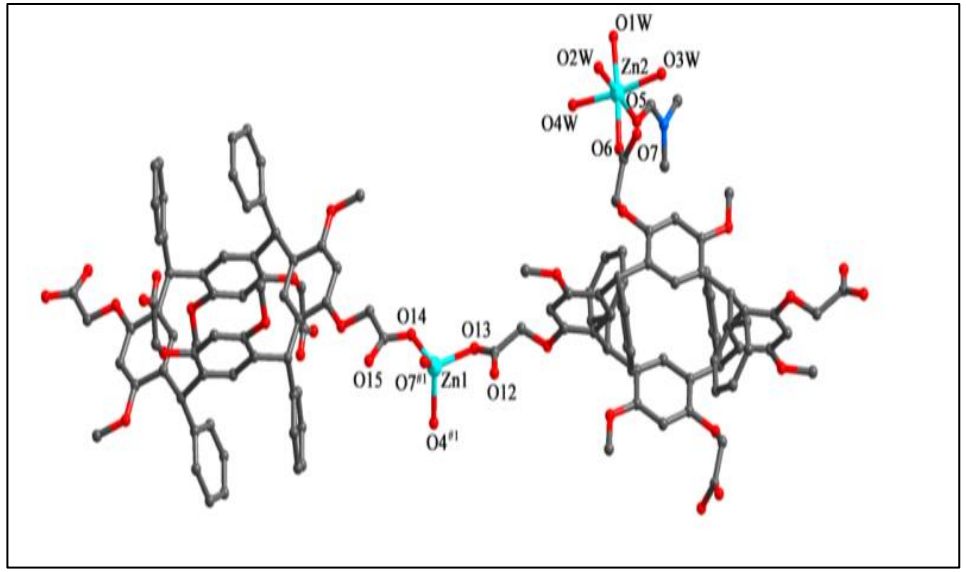
Presented at The 1st International Science and Education Summit
Faculty of Teacher Training and Education
University of Bengkulu
15-16 October 2022

- Introduction: Metal Organic Framework
  - MOF: Coordination network between metal and organic ligands containing potential voids, thus potentially porous material and large surface area

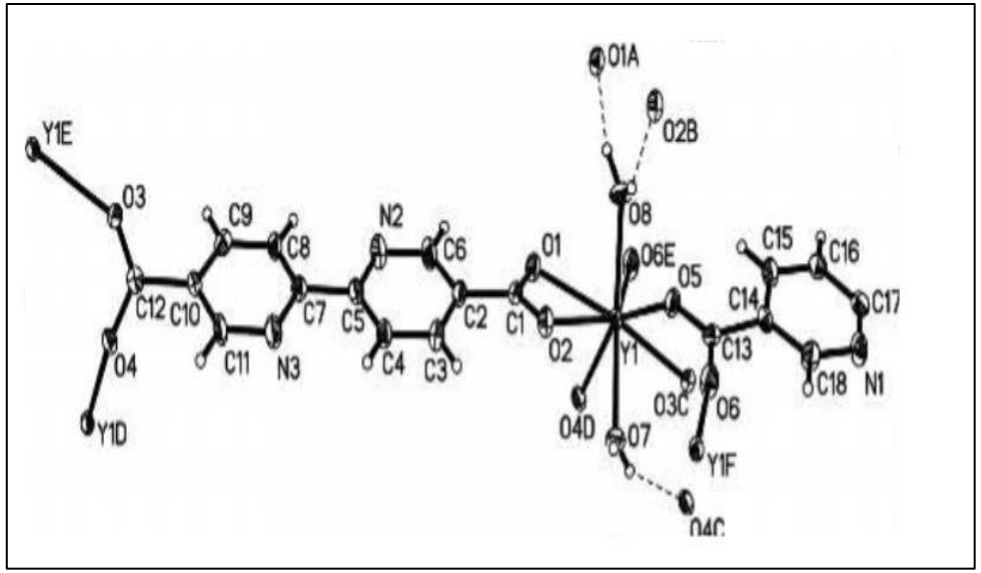
  - MOFs: potential material for various application
    - Large variety of ligand with large variety of structures
    - Metals for MOFs mostly from transition metal series on periodic table

- Introduction:
  - Lanthanides MOFs
    - Additional accessibility of *f*-orbitals, offer more stability
    - Shows some luminescence characteristic suitable for light-response



Decomposes ≈ 251°C

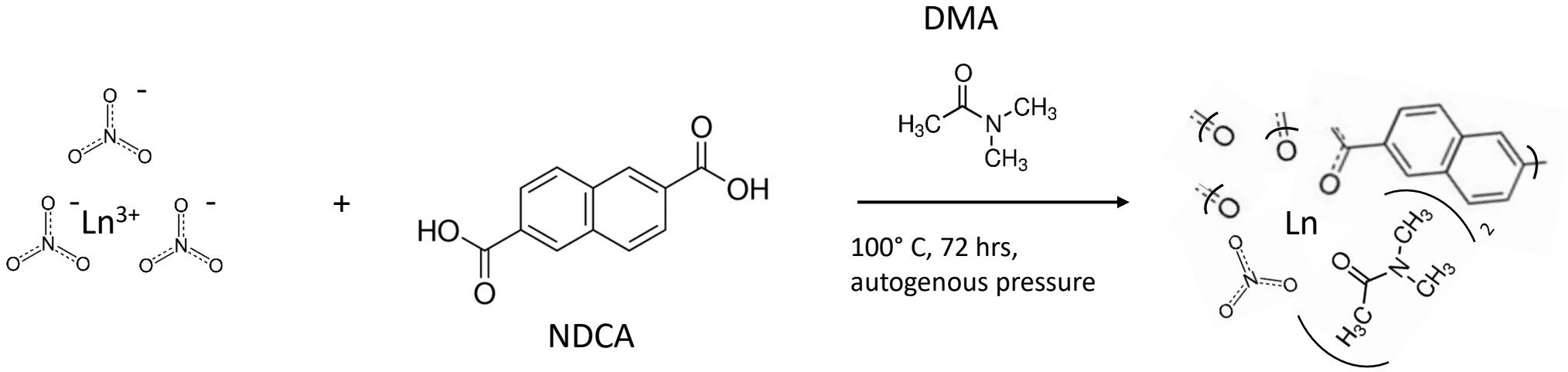
Zhao et al. *Inorganic Chemistry.* **2016,** *55* (5), 2261-2273.



Decomposes ≈ 580°C

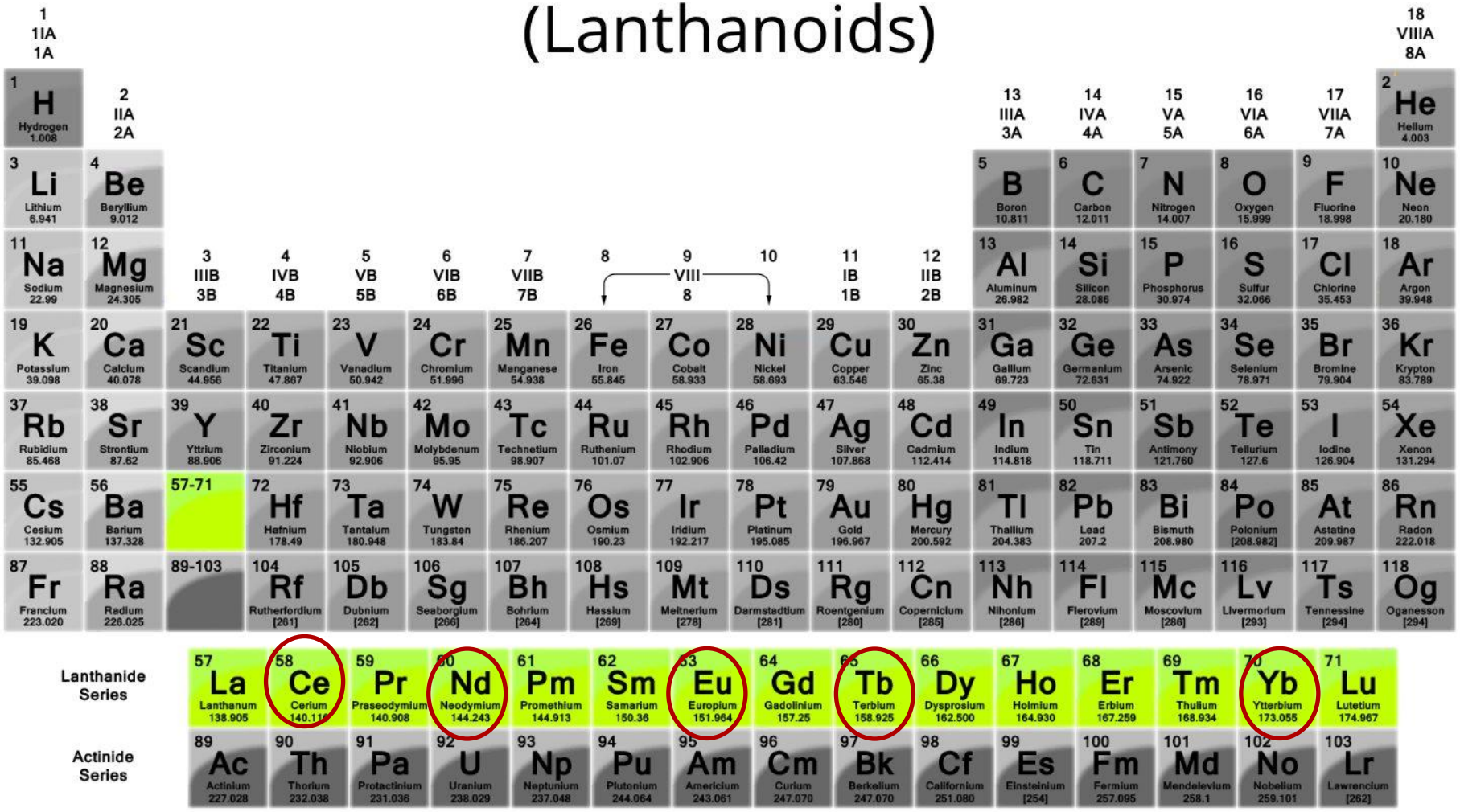
Wu, Y. et al. *Molecules*. **2014**, *19 (9)*, 14352-14365.

- Synthesis:
  - Starting materials:
    - La(III) nitrate hexahydrates
    - 2,6-napthalenedicarboxylate (NDC) acid or Benzene-1,4-dicarboxylic (BDC) acid.
    - *N,N'*-dimethylacetamide (DMA)
  - Method: solvothermal



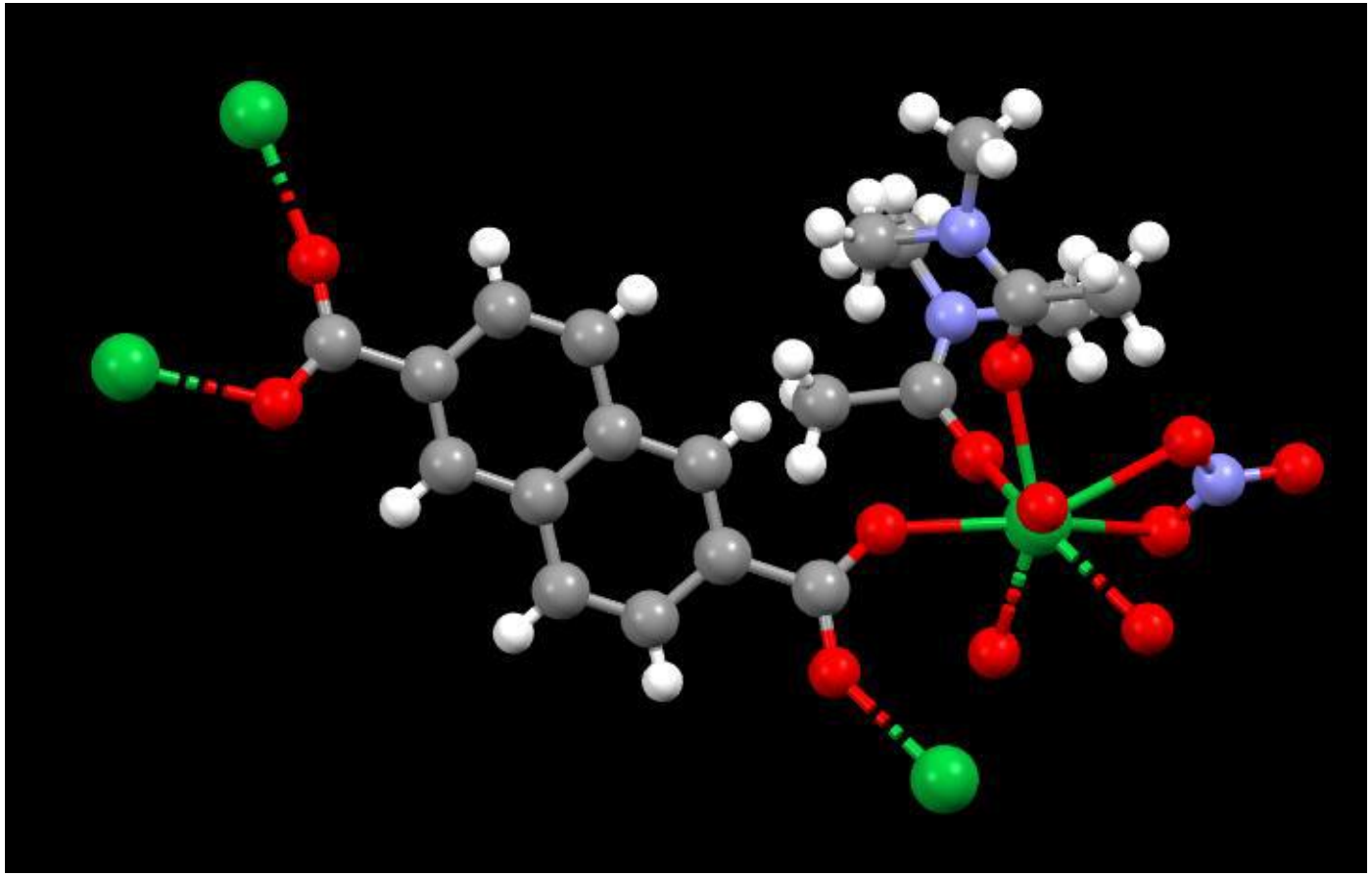
- Preveous Research

Lanthanide Series
(Lanthanoids)



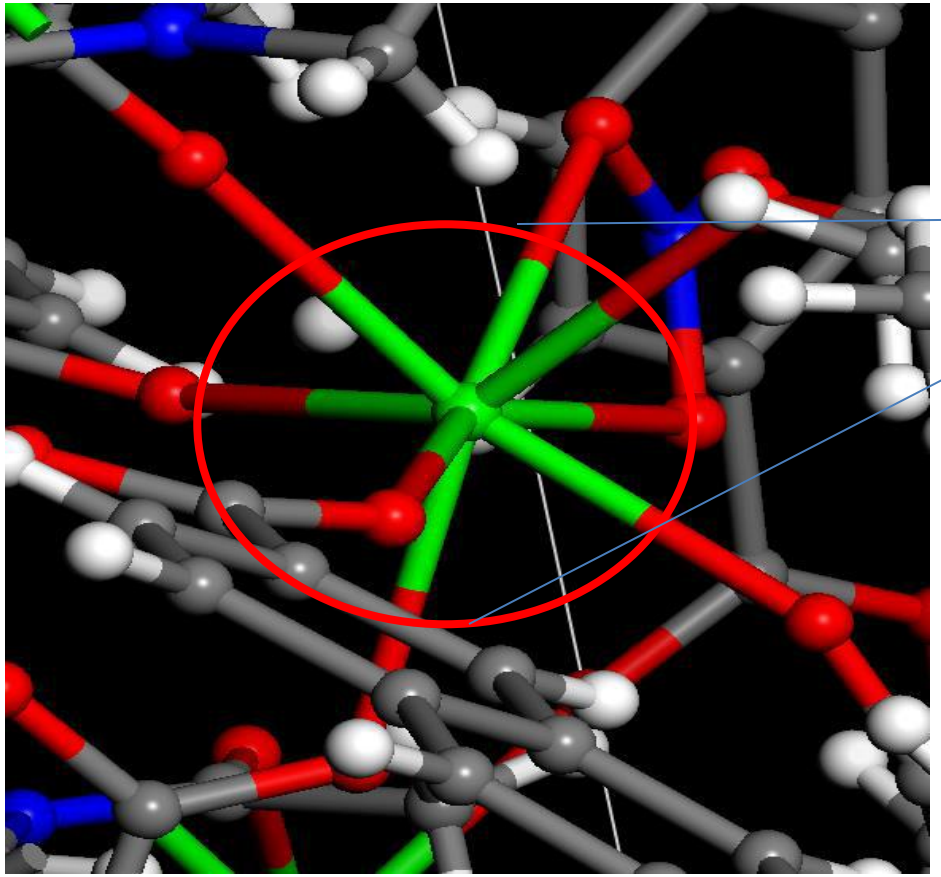
sciencenotes.org

- Characterization of $[Ln(NDC)(DMA)_2(NO_3)]_n$



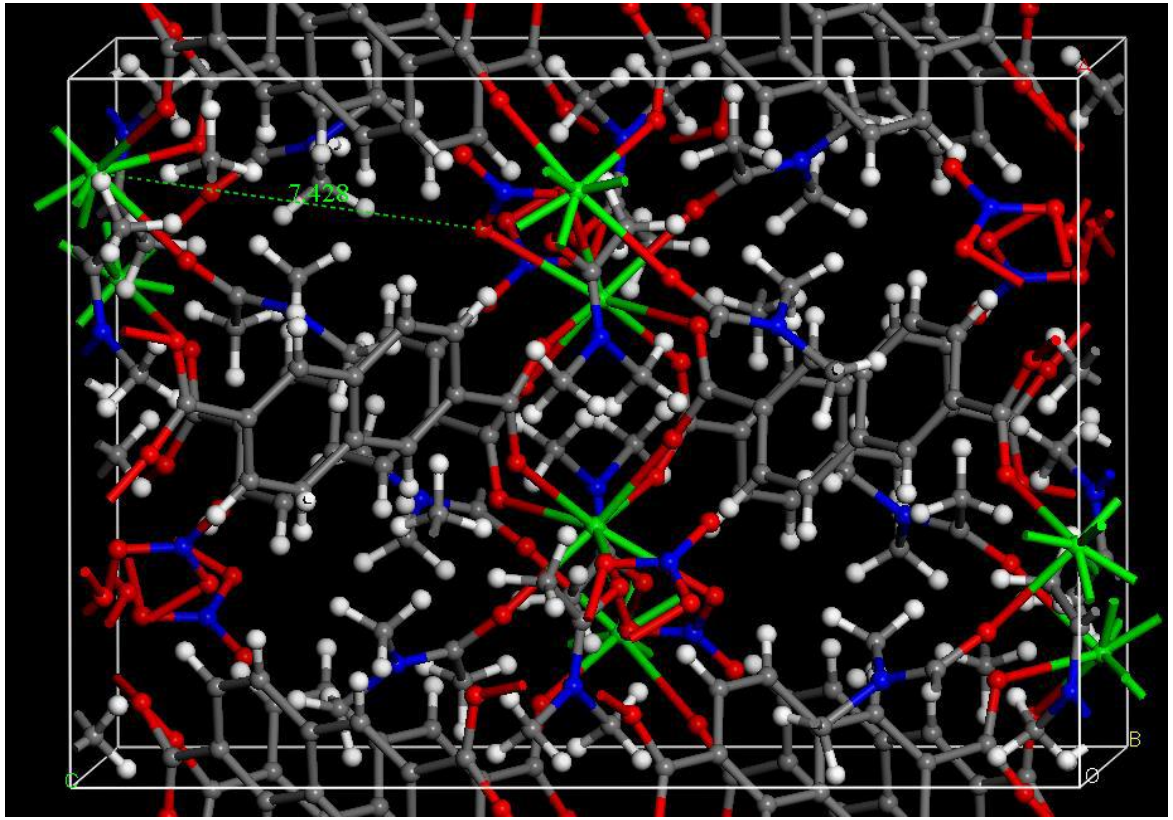
The green sphere is Ln,
grey sphere C,
blue sphere N,
red sphere O
white sphere H

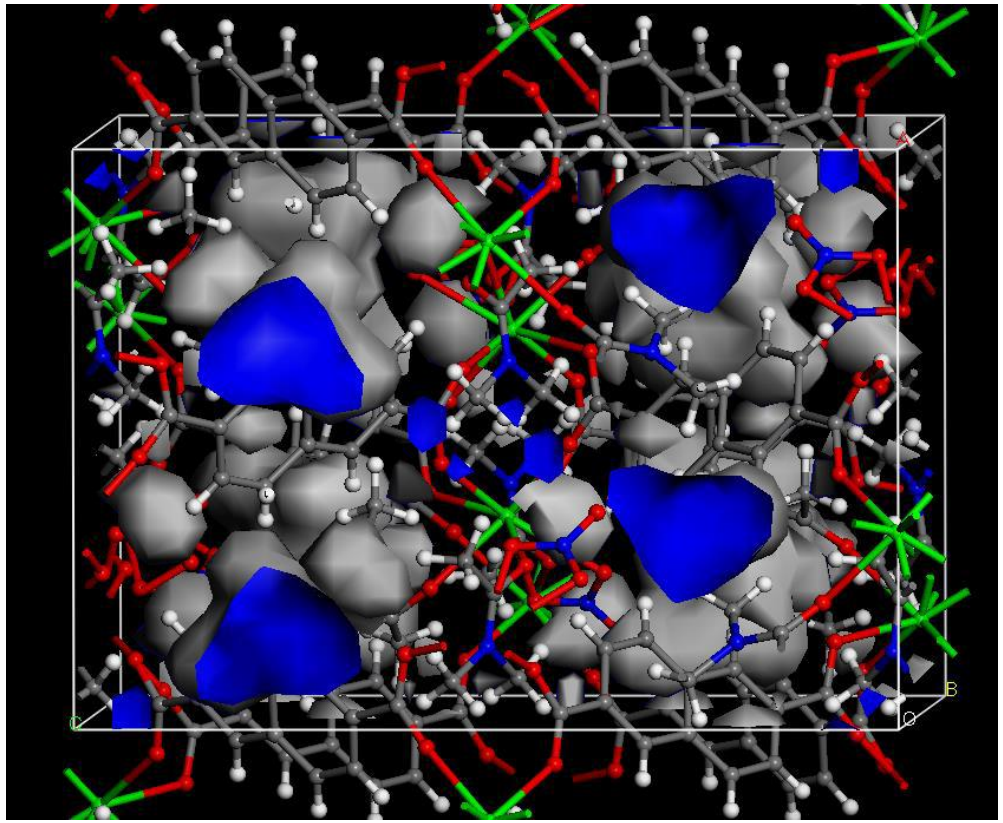
- Characterization of $[Ln(NDC)(DMA)_2(NO_3)]_n$



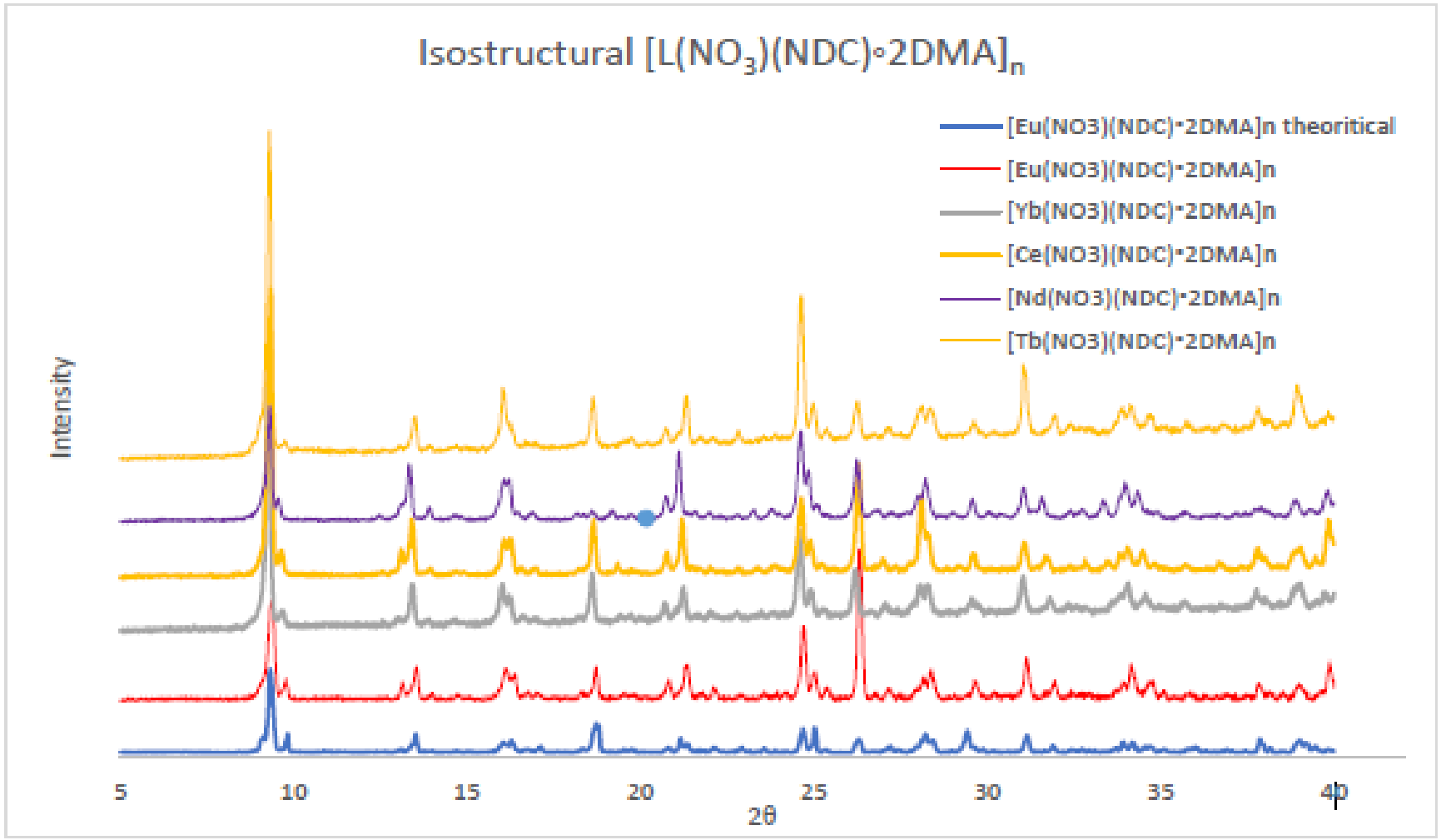
- Ln has 8 coordination number
  - One Ln is bonded to one NDC, two DMA and one NO_3^- (bidentate mode) in the unit cell.
  - It is also bonded to three NDC in adjacent cell, shown by the broken bonds. (previous slide)

- All LnMOFs are isostructural
- Contain channels within the structure which can be inserted by guest molecules to trigger electronic responses

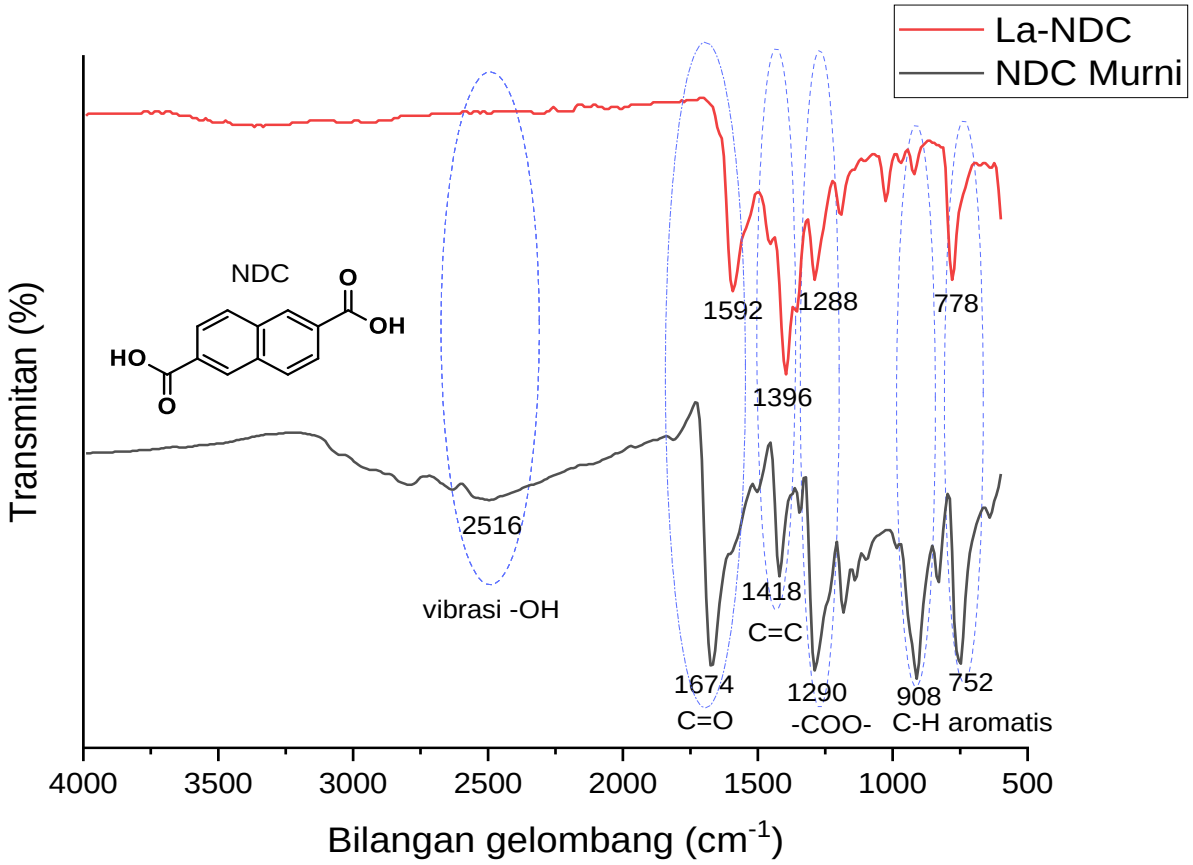


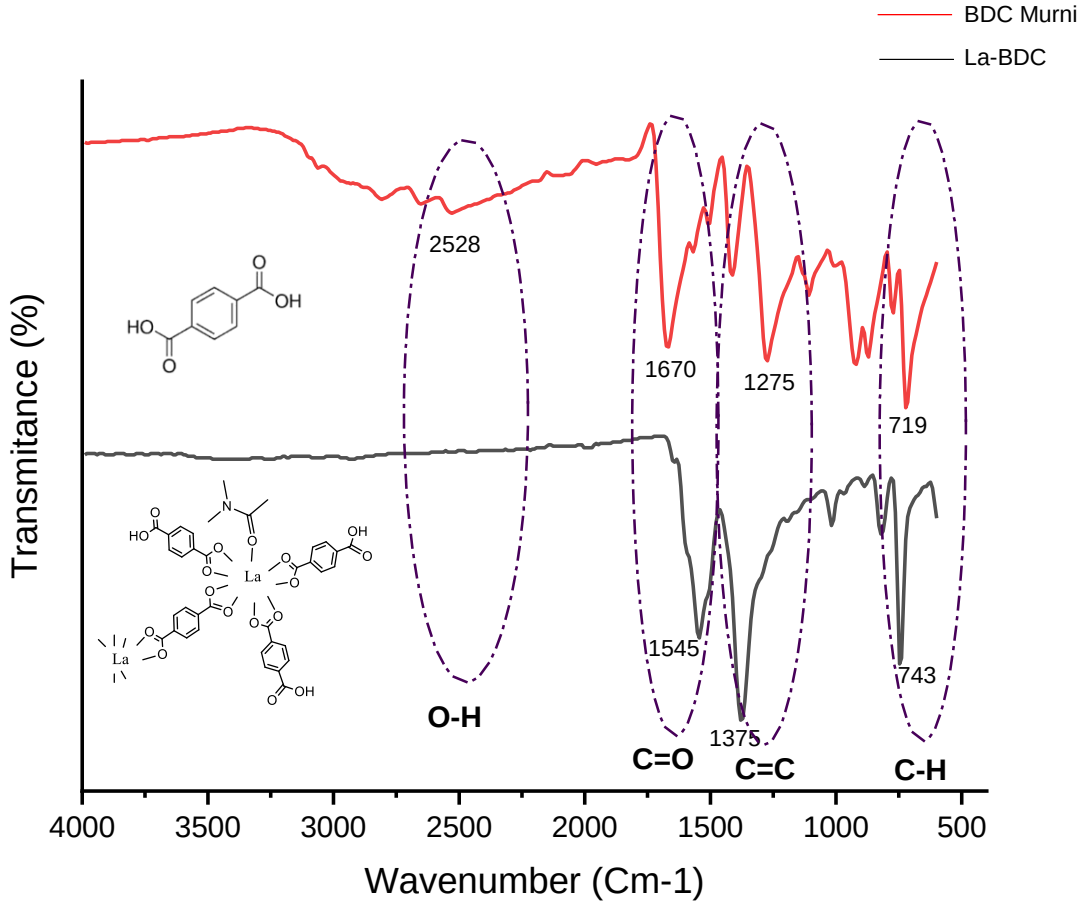


Lee, B.; Richards, F. M.. *J. Mol. Biol.* **1971**, *55* (3), 379–400.
Connolly, M. L. *J. Appl. Crystallogr.* **1983**, *16* (5), 548–558.
Connolly, M. L. *J. Mol. Graph.* **1993**, *11* (2), 139–141

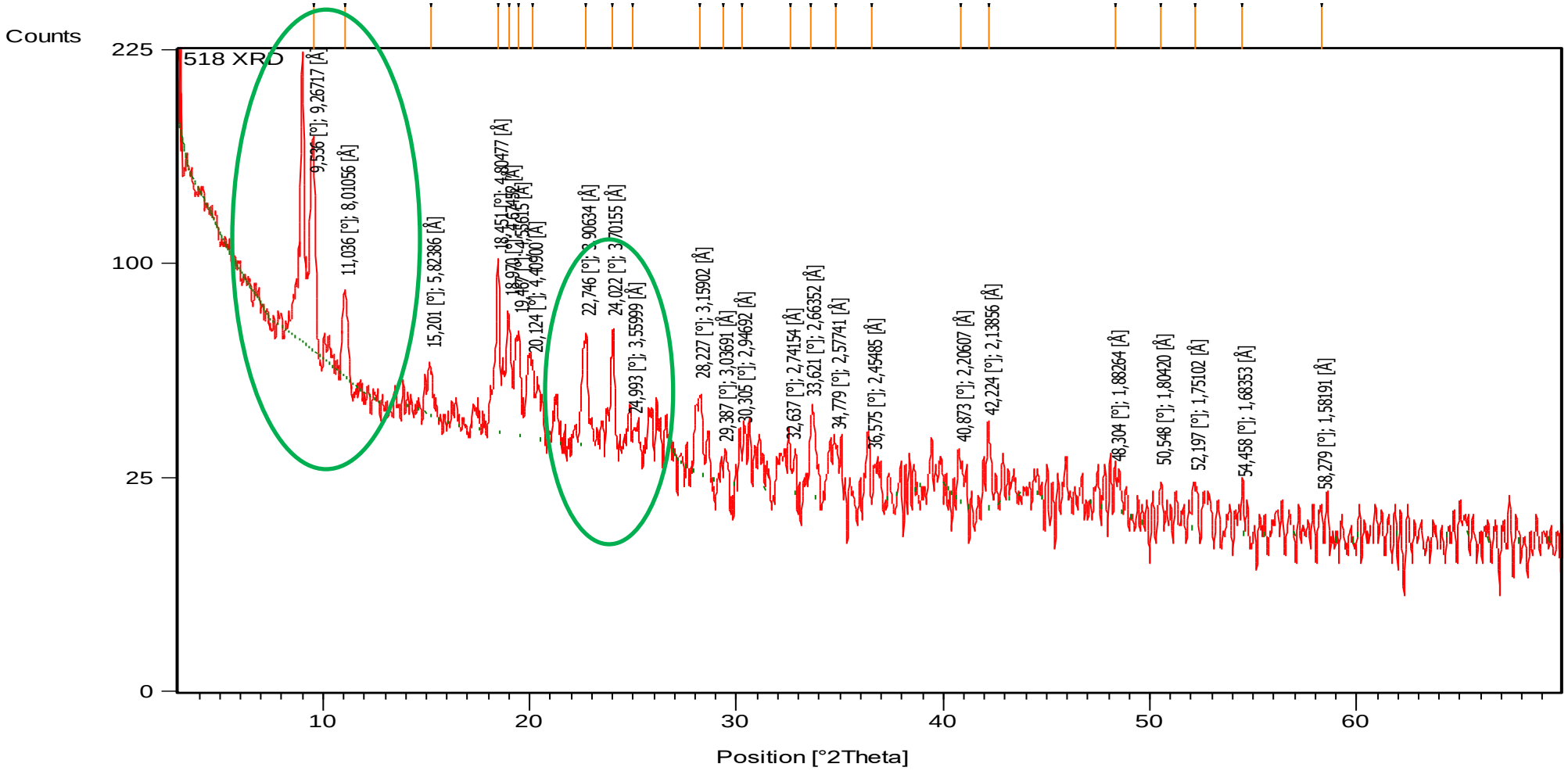

Isostructural [L(NO3)(NDC)◦2DMA]n
[Eu(NO3)(NDC)•2DMA]n theoritical
[Eu(NO3)(NDC)•2DMA]n
[Yb(NO3)(NDC)•2DMA]n
[Ce(NO3)(NDC)•2DMA]n
[Nd(NO3)(NDC)•2DMA]n
[Tb(NO3)(NDC)•2DMA]n
Intensity
5
10
15
20
25
30
35
40
2θ

- Lantanum MOF with NDC and BDC (FTIR-Spectra)

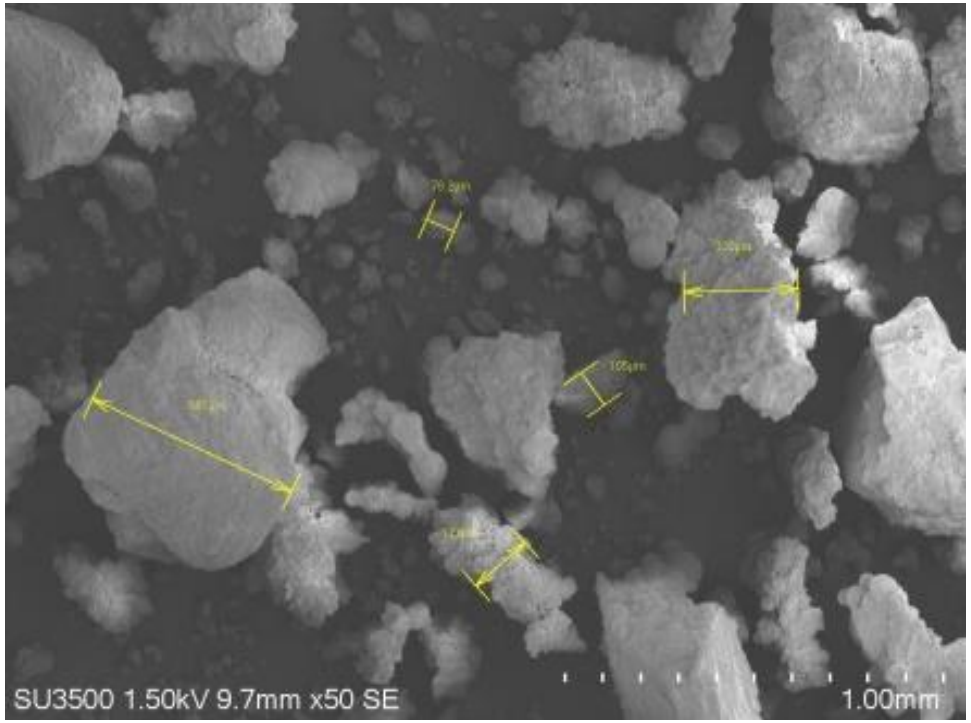




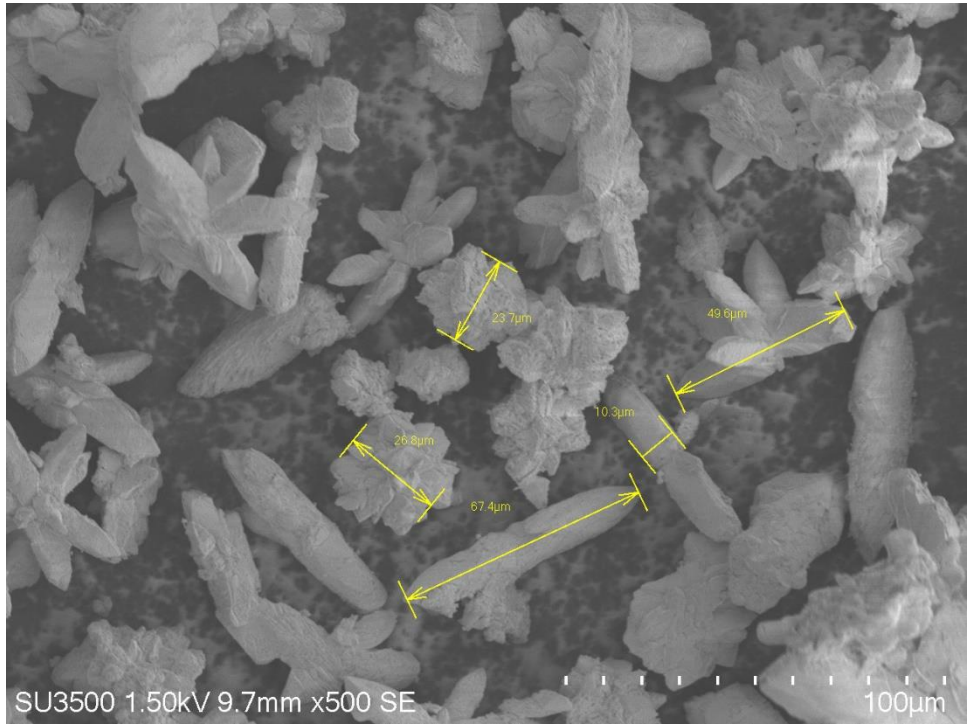
- Lantanum MOF with NDC and BDC (PXRD)



- Lantanum MOF with NDC and BDC (SEM Results)

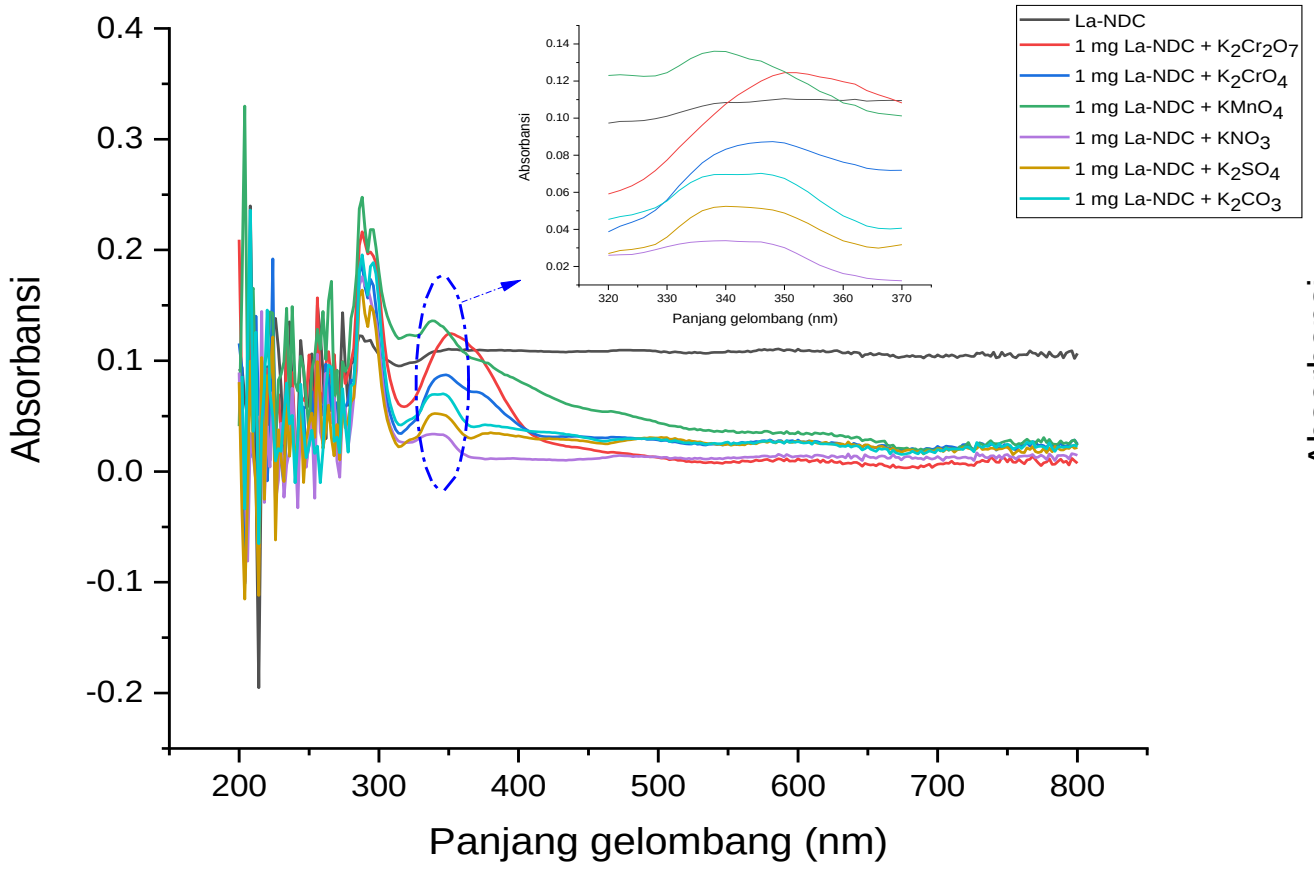


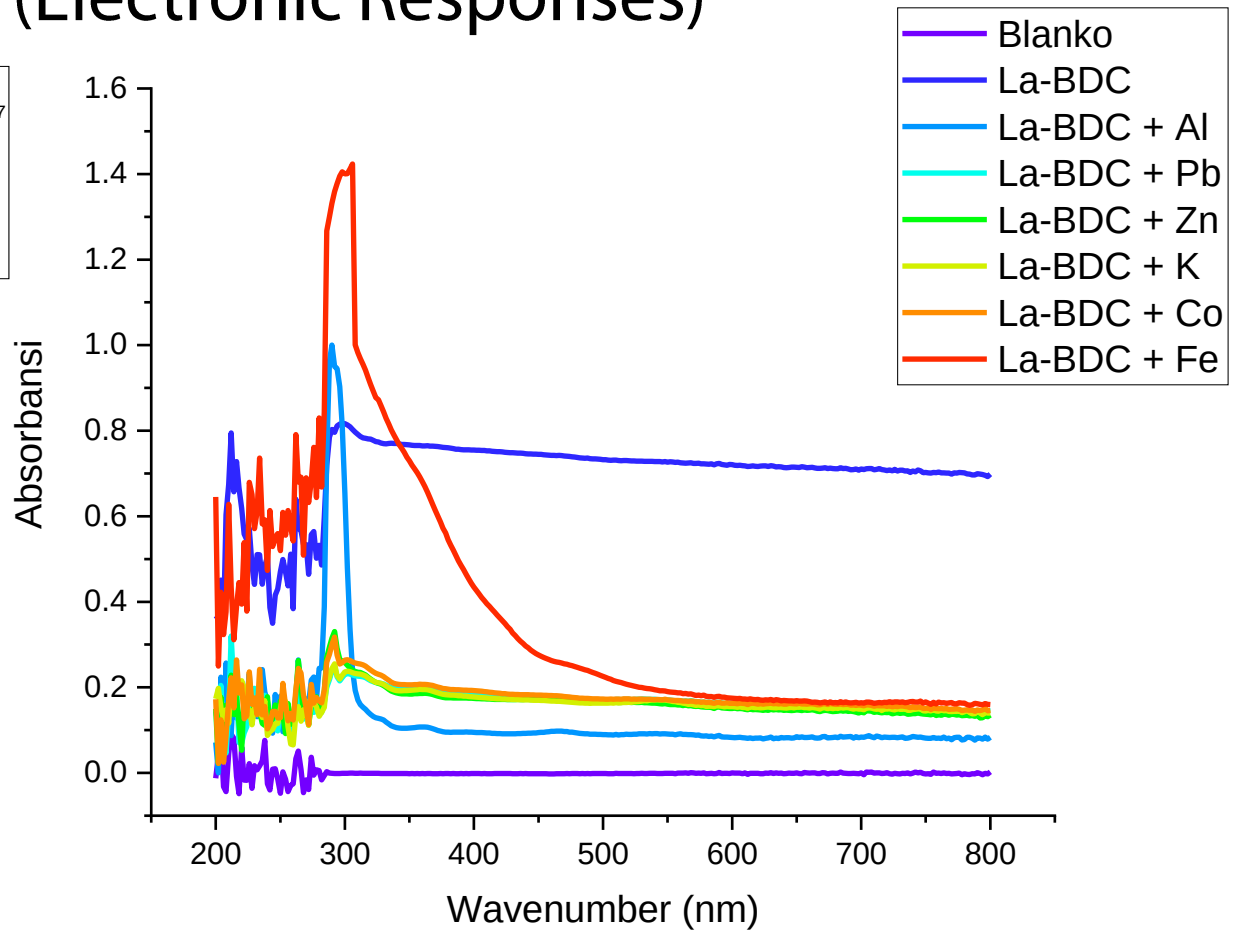
La-NDC



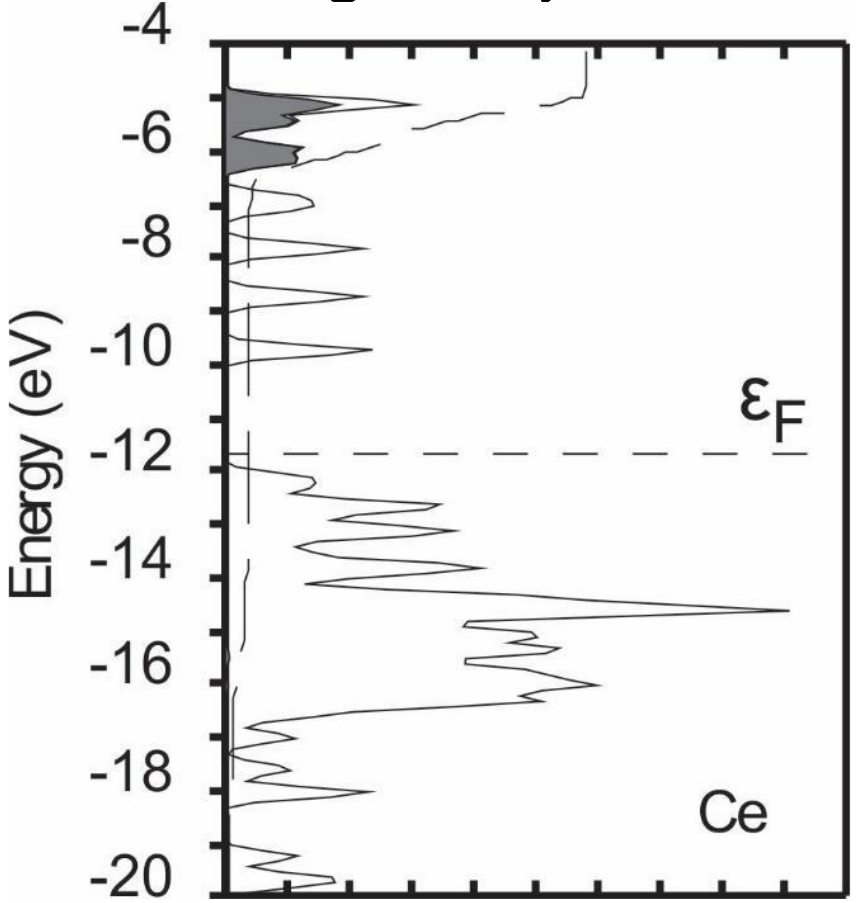
La-BDC

- Lantanum MOF with NDC and BDC (Electronic Responses)





- Sensing ability of LnMOFs



Electronic configuration* of CeMOF:

Band gap of *ca*. 2 eV.
The HOMO and LUMO consist mostly of the organic ligand NDA π and π * orbitals.

The Ce^{3+} states are high above the Fermi level and do not participate in the electronic transitions.

Depending on the relative position of the HOMO of the guest molecules, the fluorescence intensity of the LnMOF can be reduced or enhanced upon absorption of the guest molecules

Total DOS (solid curve)
Integrated value (dashed curve)
Contribution of Ce^{3+} (shaded area) of $[Ce(NDC)(DMA)_2(NO_3)]n$
The horizontal dashed line is the Fermi level

*calculated using Extended Hückel method.
Hoffmann, R. *J. Chem. Phys.* **1963**, *39* (6), 1397–1412

Conclusion

- La-NDC and La-BDC were successfully synthesis based on comparation of PXRD pattern of previous Ln-MOF and FTIR results
- SEM results of La-NDC and La-BDC MOFs shows impurities present. However, crystals were formed with a more unanimous shape for La-BDC.
- La-NDC shows responses of oxo-anions and La-BDC shows responses to Al^{3+} and Fe^{3+}
- Further study is needed for their potential as sensor based on electronic properties

Question(s)?