

Desing-ul unor noi liganzi de tip antenă pentru obținerea de materiale luminescente ale lantanidelor

PN-III-P1-1.1-TE-2019-1345 (TE 109)

Financial support: UEFISCDI

Project team:

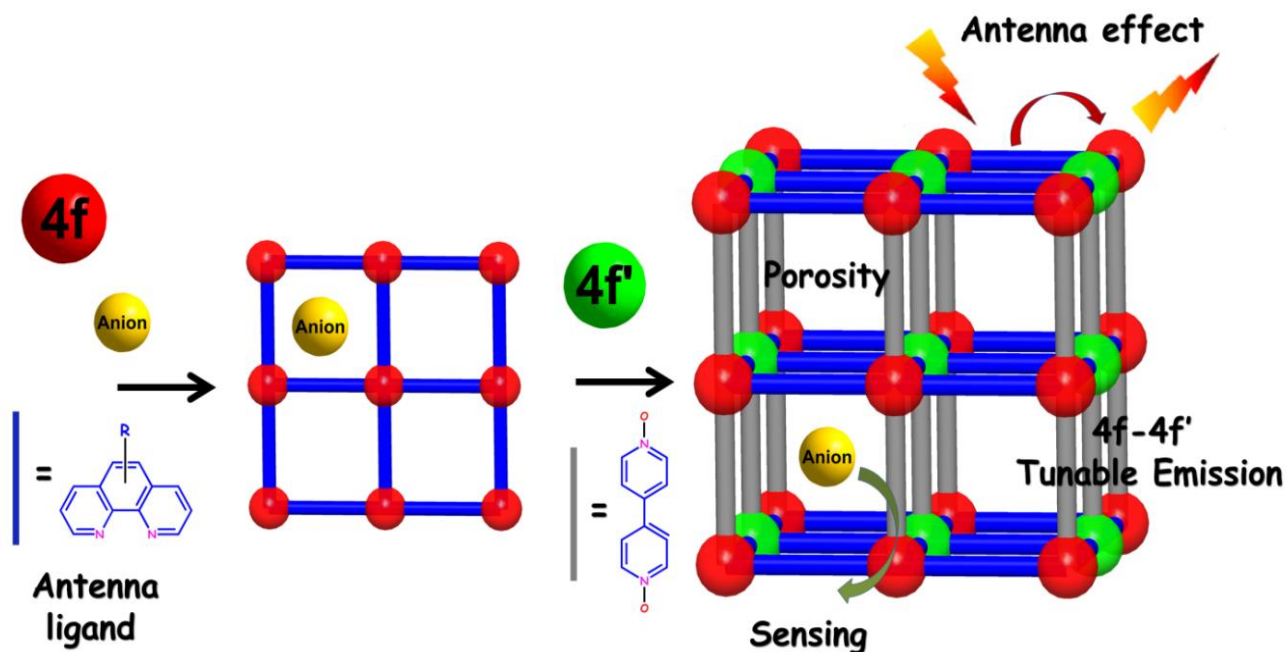
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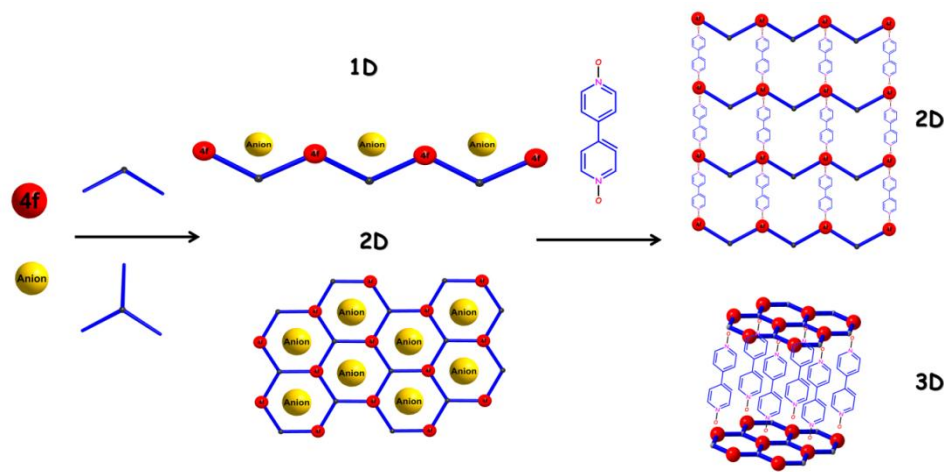
Abstract:

The present project will focus on the synthesis and characterization of new lanthanide metal-organic frameworks for luminescent sensing and light-emitting applications. The molecular systems are based on pre-formed lanthanide-phenanthroline derivatives precursors and organic spacers or lanthanide metalloligands using the molecular approach. This strategy relies on the acting of phenanthroline derivatives as C3 ligands and will be used for the first time in lanthanide chemistry.

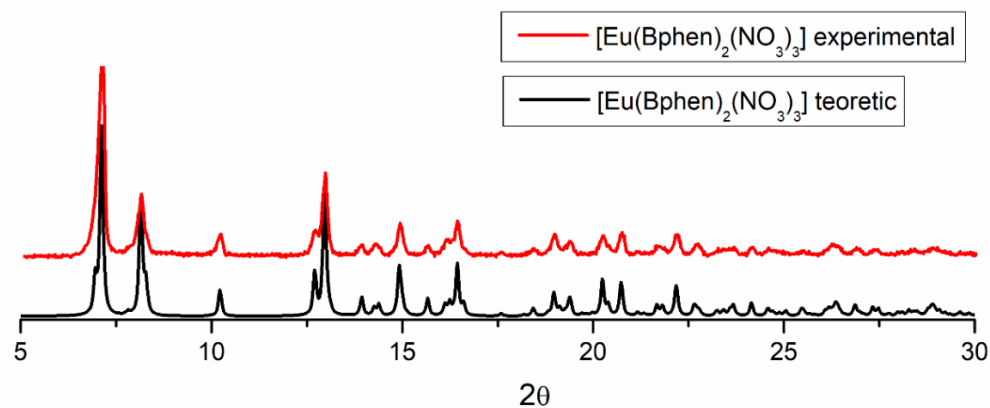
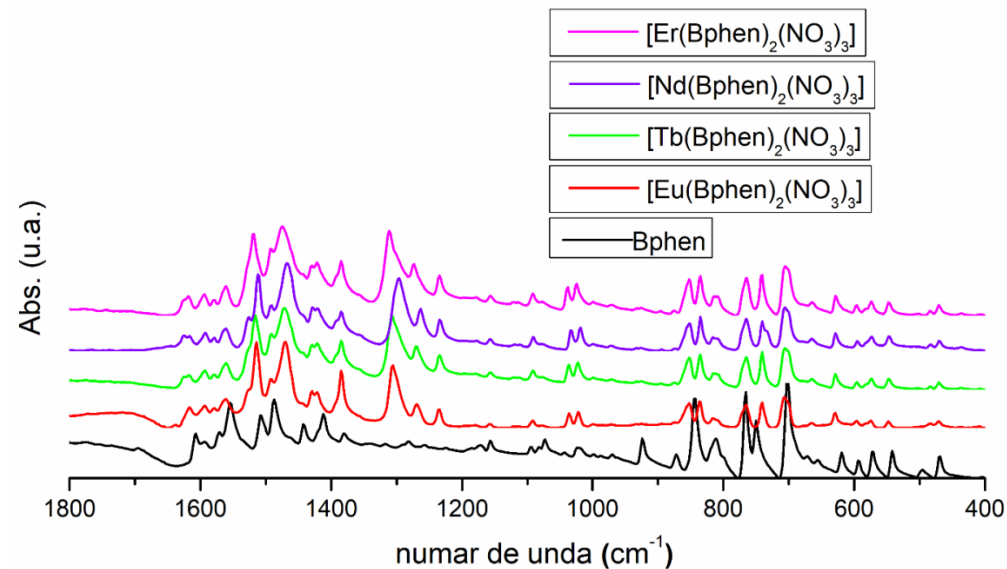
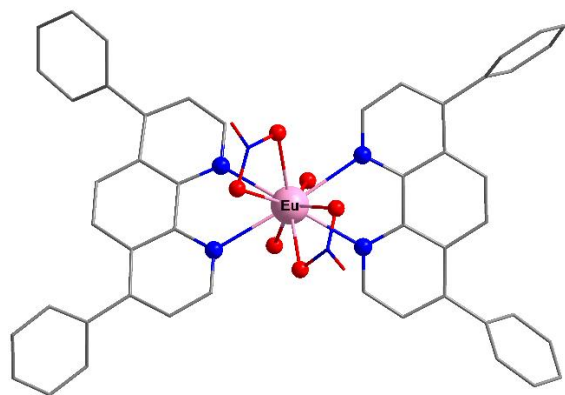


Objectives:

- A. *Design, synthesis and characterization of new organic phenanthroline based ligands (C_2 or C_3 type).*
- B. *Design, synthesis and characterization of new homometallic 4f complexes to be further used as nodes.*
- C. *Investigation of the luminescent properties of the complexes; exploration of the sensing abilities of the functionalized phenanthroline based ligands towards various lanthanide ions.*
- D. *Design, synthesis and characterization of new lanthanide metal-organic frameworks containing phenanthroline based ligands.* To the best of our knowledge, this synthetic approach has not been investigated so far.



Results 2020:



Results 2021:

Prezentare orală



CHIRAL MAGNETIC AND LUMINESCENT MATERIALS BASED ON TRIDENTATE SCHIFF BASE LIGANDS

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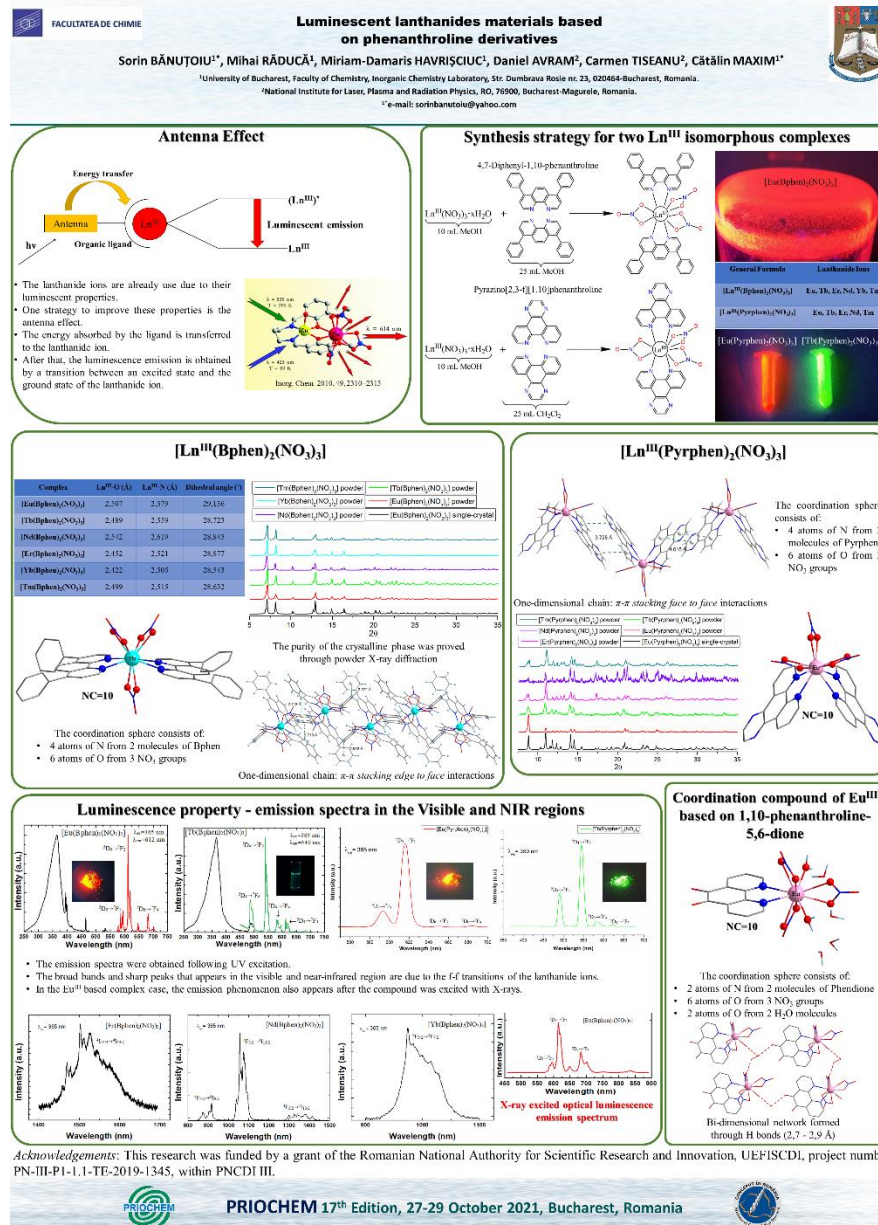
PRIOCHEM 17th Edition, 27-29 October 2021, Bucharest, Romania



1



Poster



Luminescent Lanthanide Complexes

Based on POMs Ligands

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Introduction

A remarkable property of certain lanthanides is their luminescence.[1] The fluorescence of rare-earth-metal ions has applications in many fields, such as optical switching, display, illumination, communication and imaging. It is already known that the luminescence can be strongly increased by attaching an appropriate organic or inorganic ligand to the Ln^{III} ion, thus exploiting the so-called antenna effect.[2] The aim of this research was to apply this strategy for obtaining luminescent complexes, using POMs as multifunctional ligands with large active sites which can easily combine with lanthanides ions.

Synthesis

We present herein the synthesis of four isostructural compounds $\text{Na}_4[\text{Eu}^{\text{III}}\text{W}_{10}\text{O}_{36}]\cdot 35\text{H}_2\text{O}$ (1), $\text{Na}_4[\text{Tb}^{\text{III}}\text{W}_{10}\text{O}_{36}]\cdot 35\text{H}_2\text{O}$ (2), $\text{Na}_4[\text{Dy}^{\text{III}}\text{W}_{10}\text{O}_{36}]\cdot 35\text{H}_2\text{O}$ (3) and $\text{Na}_4[\text{Sm}^{\text{III}}\text{W}_{10}\text{O}_{36}]\cdot 35\text{H}_2\text{O}$ (4) starting from sodium tungstate dihydrate ($\text{Na}_2\text{WO}_4\cdot 2\text{H}_2\text{O}$) as a tungsten precursor and lanthanide nitrates. Each compound was prepared in the same manner: 8.3g of $\text{Na}_2\text{WO}_4\cdot 2\text{H}_2\text{O}$ was dissolved in 20 ml of water and the solution pH was adjusted to 7.2 with CH_3COOH . An aqueous solution (4 ml) containing 1.1g of $\text{Ln}(\text{NO}_3)_3\cdot x\text{H}_2\text{O}$ ($\text{Ln} = \text{Eu}, \text{Tb}, \text{Dy}, \text{Sm}$) was added dropwise to the above-mentioned solution with stirring at 80°C. Cooling the solution at room temperature yielded colorless crystals of $\text{Na}_4[\text{Ln}^{\text{III}}\text{W}_{10}\text{O}_{36}]\cdot 35\text{H}_2\text{O}$ which were filtered off and dried in air.

Results and discussion

X-ray crystallography

These compounds crystallize in the triclinic system, different from the similar compound presented in the literature, which crystallizes in the monoclinic system. [3]

The single-crystal structures of compound 1 displays the presence of a sandwich-type cluster $[\text{EuW}_{10}]$, Na^+ cations and 35 molecules of crystallization water (Figure 1). The Eu^{3+} ion in the center of the anion achieves eight-fold coordination by attachment of two $\text{W}_{10}\text{O}_{36}$ ligands, constituting a distorted square antiprism. The bond distances between W and O are 1.737 Å for W – O_t , 1.937 Å for W – O_b , and 2.316 Å for W – O_c , where O_b represents the bridging oxygen of two octahedra sharing a corner, O_c the bridging oxygen of two octahedra sharing an edge, and O_t the terminal oxygen. The distance between O and Eu is 2.430 Å.

Na^+ ions that counterbalance the negative charge of the cluster $[\text{EuW}_{10}]$ form an extended network, by coordinating with the water molecules and oxygen atoms of the metallic clusters.

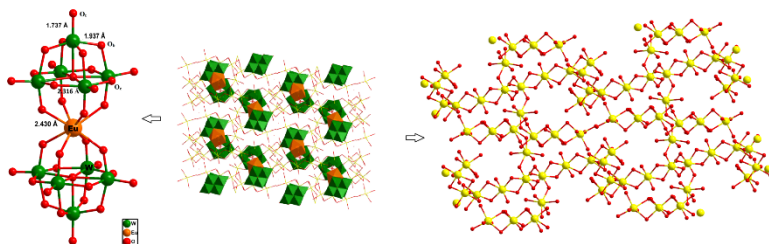


Fig 1. Molecular structure of the cluster $[\text{EuW}_{10}]$ (left) and the extended network of Na^+ ions (right) from the $\text{Na}_4[\text{EuW}_{10}\text{O}_{36}]\cdot 35\text{H}_2\text{O}$ compound

Prezentare orală

 University of Bucharest
The Faculty of Chemistry

 Luminescent lanthanides
materials based on
phenanthroline derivatives

 Scientific leader:
Lect. Univ. CĂTĂLIN MAXIM

 Student:
SORIN BĂNUȚOIU

 International Conference "Students for Students"
- ICSFS XVIIth edition - 2021

Invited talk

International Conference on Molecular Magnetism 2021

Chirality driven self-assembly in copper(II) coordination polymers



UNIVERSITATEA
DIN BUCUREȘTI
— VIRTUTE ET SAPIENTIA



Catalin Maxim






Faculty of Chemistry, Inorganic Chemistry Department

PAPER

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Cite this: DOI: 10.1039/d1dt01550h

Luminescence thermometry based on one-dimensional benzoato-bridged coordination polymers containing lanthanide ions†‡

Alexandru Topor,  §^a Daniel Avram,  §^b Radu Dascalu,  ^c Catalin Maxim,  ^a
Carmen Tiseanu^{*b} and Marius Andruh  ^{*a,d}

Acknowledgements

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Results 2022:

Invited talk

Chiralitate versus Achiralitate în complecși de Cu(II)
construiți cu liganzi de tip bază Schiff

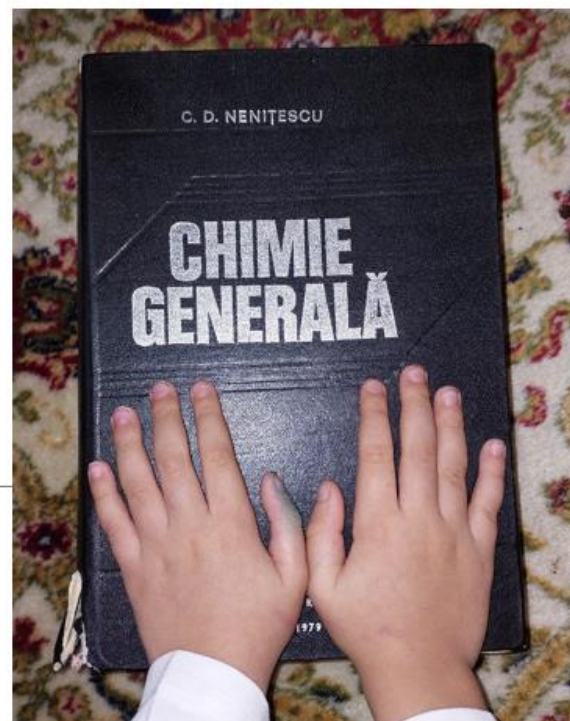


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Simpozion
120 de ani de la nasterea Academicianului
Costin D. Nenitescu

Catalin Maxim

Facultatea de Chimie, Universitatea din Bucuresti





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POLYMERS**
Catalin Maxim, Sorin Banutoiu, Andreea Pavel, Andreea Lupoiaia, Cristian
D. Ene

Poster

**POLYOXOMETALATES AS LIGANDS FOR OBTAINING
LANTHANIDE-BASED LUMINESCENT COMPLEXES**

Cristian D. Ene, Diana Claudia Lichi, Sorin Banutoiu, Catalin
Maxim



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**EDITIA
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Prezentare orală

**A NEW NITRONYL-NITROXIDE LIGAND FOR DESIGNING
BINUCLEAR Ln_{III} COMPLEXES: SYNTHESSES, CRYSTAL STRUCTURES,
MAGNETIC AND EPR STUDIES**

Mihai Răducă

Prezentare orală

**CHIRAL COBALT(II) COMPLEXES BASED ON
CARBOXYLATO AND AMINOALCOHOLS LIGANDS**

Andreea-Maria PÎRVU, Violeta TUDOR, Cătălin MAXIM

NeXT-Chem

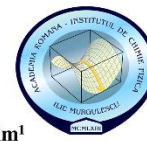
INNOVATIVE CROSS-SECTORAL
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4th EDITION, 19-20 MAY, 2022



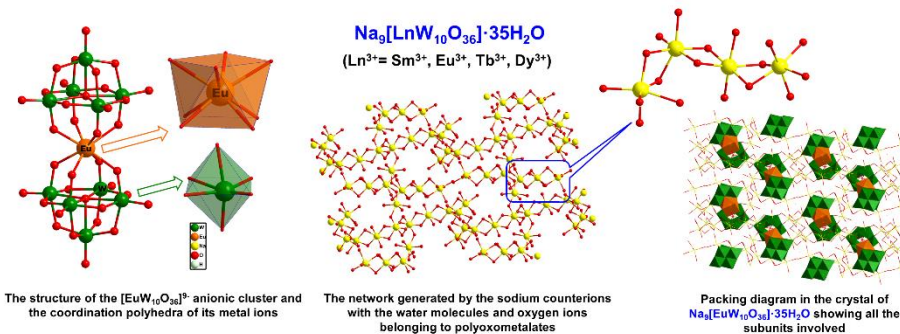
Polyoxometalates as Ligands for Obtaining Lanthanide-Based Luminiscent Complexes



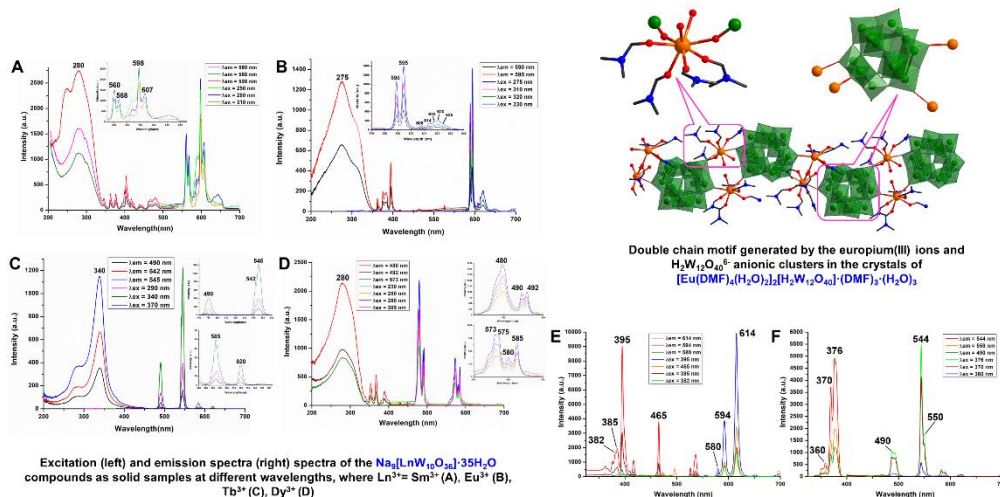
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Empirical formula	Na ₉ [EuW ₁₀ O ₃₆]·35H ₂ O	Na ₉ [SmW ₁₀ O ₃₆]·35H ₂ O	Na ₉ [TbW ₁₀ O ₃₆]·35H ₂ O	Na ₉ [DyW ₁₀ O ₃₆]·35H ₂ O	[Eu(DMF) ₄ (H ₂ O) ₂] ₂ [H ₂ W ₁₂ O ₄₀](DMF) ₂ ·(H ₂ O) ₃	[Tb(DMF) ₄ (H ₂ O) ₂] ₂ [H ₂ W ₁₂ O ₄₀](DMF) ₂ ·(H ₂ O) ₃
Crystal system	triclinic	triclinic	triclinic	triclinic	triclinic	triclinic
Space group	P-1	P-1	P-1	P-1	P-1	P-1
a/Å	12.7725(2)	12.5870(2)	12.6781(2)	12.5671(3)	15.4014(3)	15.49(4)
b/Å	13.1115(2)	13.0100(3)	13.2113(4)	13.1124(4)	23.5468(4)	23.56(3)
c/Å	20.4943(4)	20.4100(4)	20.4681(3)	20.4013(3)	24.8242(4)	24.83(3)
α/°	82.769(2)	82.532(2)	82.801(2)	82.466(3)	98.9579(19)	99.24(15)
β/°	74.549(2)	74.712(3)	74.5630(10)	74.564(2)	93.504(2)	94.43(12)
γ/°	88.9590(10)	89.012(2)	88.981(2)	89.124(2)	106.164(2)	105.44(15)
Volume/Å ³	3281.34(10)	3196.15(12)	3278.12(12)	3211.91(14)	8489.3(3)	8552.88(20)



Excitation (left) and emission spectra (right) spectra of the Na₉[LnW₁₀O₃₆]·35H₂O compounds as solid samples at different wavelengths, where Ln³⁺ = Sm³⁺ (A), Eu³⁺ (B), Tb³⁺ (C), Dy³⁺ (D).

Excitation (left) and emission spectra (right) spectra of the [Eu(DMF)₄(H₂O)₂]₂[H₂W₁₂O₄₀](DMF)₂·(H₂O)₃ compounds as solid samples at different wavelengths, where Ln³⁺ = Eu³⁺ (E), Tb³⁺ (F).

Papers

Pharmaceutics **2022**, *14*(8), 1692;

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Enantiomeric pairs of copper(II) complexes with tridentate Schiff bases derived from *R*- and *S*-methionine: the role of decorating organic groups of the ligand in crystal packing and biological activity†‡

Catalin Maxim, ^a Cristian D. Ene, ^{*a,b} Ioana Nicolau, ^c Lavinia L. Ruta ^c and Ileana C. Farcasanu ^{*c}

Acknowledgements

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