



Europium homodinuclear triple stranded helicates: insight into the self assembly mechanisms

Josef Hamacek, Mourad Elhabiri, Sylvie Blanc, Claude Piguet, Anne-Marie Albrecht-Gary

► To cite this version:

Josef Hamacek, Mourad Elhabiri, Sylvie Blanc, Claude Piguet, Anne-Marie Albrecht-Gary. Europium homodinuclear triple stranded helicates: insight into the self assembly mechanisms. European Research Conference on Natural Waters and Water Technology,, Aug 2002, San Feliu de Guixols, Spain. <hal-05442738>

HAL Id: hal-05442738

<https://univ-pau.hal.science/hal-05442738v1>

Submitted on 5 Jan 2026

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



HAL Authorization

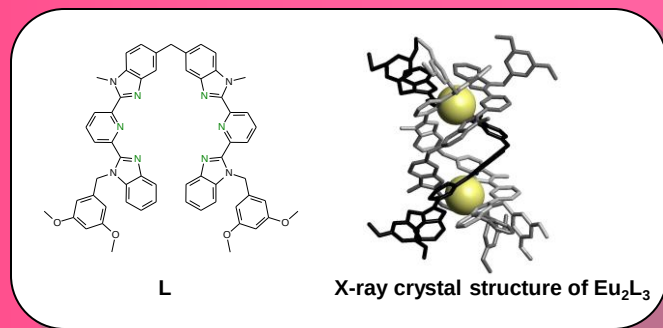
Josef Hamacek^a, Mourad Elhabiri^a, Sylvie Blanc^a, Claude Piguet^b, Anne-Marie Albrecht-Gary^a

^a Laboratoire de Physico-Chimie Bioinorganique, UMR 7509 du CNRS, ECPM, Université Louis Pasteur, Strasbourg, France.

^b Department of Inorganic, Analytical and Applied Chemistry, University of Geneva, Geneva, Switzerland.

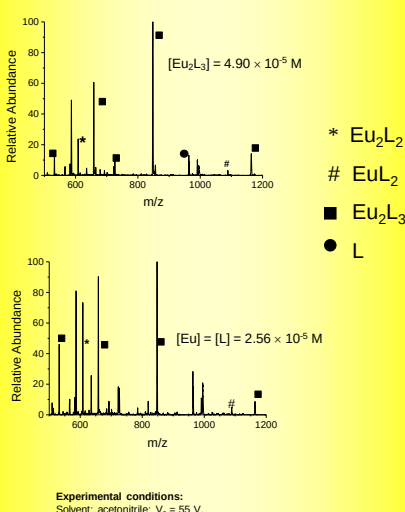
Introduction

The preparation of novel supramolecular structures is a subject of much current interest. The peculiar photophysics of the lanthanides have aroused the development of efficient luminescent sensors with interesting three-dimensional supramolecular topographies. The high potential of applications of the lanthanide helicates in chemical, biochemical and medical domains, increases the interest of thermodynamic and kinetic studies of these compounds. In this work, the speciation studies on the europium(III) complexes formed with the hexadentate receptor L were carried out and the self-assembly mechanism of a triple stranded dimetallic helicate Eu_2L_3 was established.



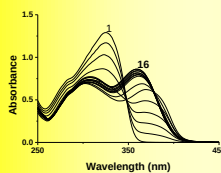
Mass Spectrometry

Electrospray Mass Spectra



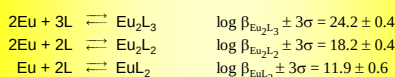
Spectrophotometry

Titration

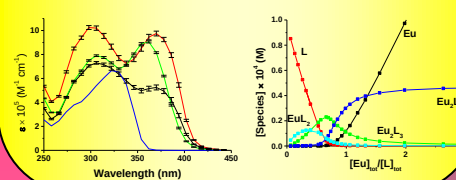


Experimental conditions:
Solvent: acetonitrile
 $T = 25.0$ (1°C); $l = 0.2$ cm;
[L]_{tot} = 9.64×10^{-5} M;
Spectra 1-16: [Eu]_{tot}/[L]_{tot} = 0 - 6.4

Stability Constants

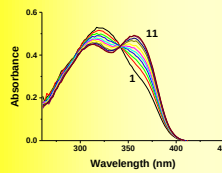


Electronic Spectra and Distribution Curves



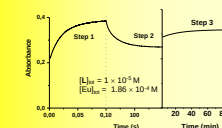
Formation Kinetics

Time-Resolved Absorption Spectra



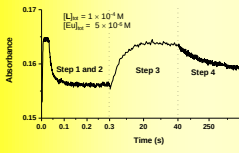
Experimental conditions:
Solvent: acetonitrile;
 $T = 25.0$ (1°C); $l = 1$ cm;
[L]_{tot} = 10^{-5} M; [Eu]_{tot} = 10^{-4} M.
Spectra: 12 ms, 11 280 ms.

Kinetics in Excess of Eu(III)

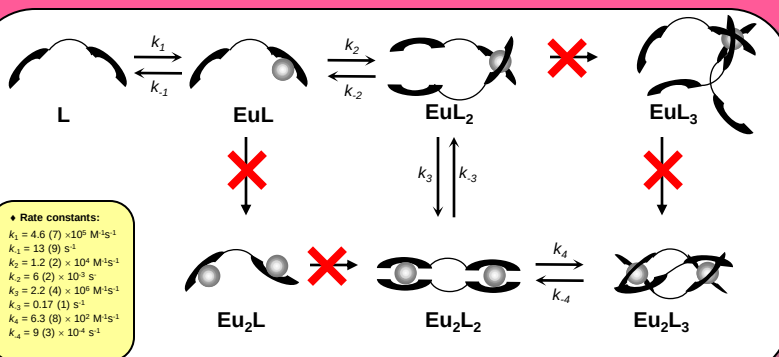


Experimental conditions:
Solvent: acetonitrile;
 $\lambda = 375$ nm; $T = 25.0$ (1°C);
 $l = 1$ cm.

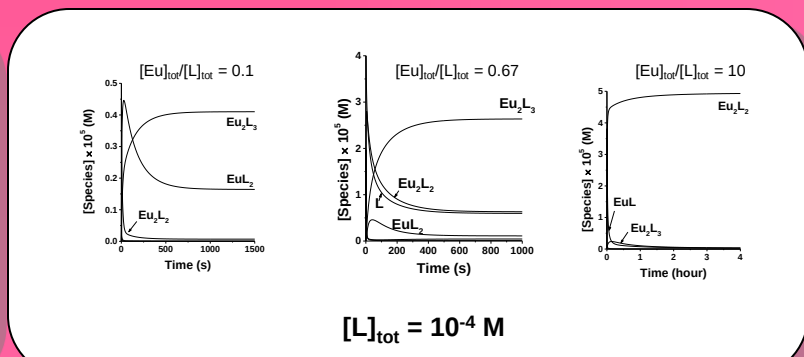
Kinetics in Excess of L



Self-Assembling Mechanism



Kinetic Simulation



Conclusion

The experimental data obtained by a combination of electrospray mass spectrometry (ESMS), absorption spectrophotometry and fast kinetic techniques provided information on the key steps of a self-assembly process of a dinuclear triple-stranded europium helicate Eu_2L_3 . It was shown that the supramolecular edifice was totally formed at high concentrations of L ($\approx 10^{-2}$ M) and under strict stoichiometric conditions.

Acknowledgement

This Research was supported through a European Community Marie Curie Fellowship. The authors thank the French CNRS and Ministry of Research and Technology for financial support.

References

(1) Piguet, C.; Bünzli, J.-C. G.; Bernardinelli, G.; Hopfgartner, G.; Williams, A. F., J. Am. Chem. Soc., 1993, 115, 8197-8206. (2) Elhabiri, M.; Scopelliti, R.; Bünzli, J.-C. G.; Piguet, C., J. Am. Chem. Soc., 1999, 121, 10747-10762. (3) Blanc, S.; Yakir witch, P.; Leize, E.; Meyer, M.; Libman, J.; Van Dorsselaer, A.; Albrecht-Gary, A.-M.; Shanzer, A., J. Am. Chem. Soc., 1997, 119, 4934-4944. (4) Fatim-Rouge, N.; Blanc, S.; Pflé, A.; Rigault, A.; Albrecht-Gary, A.-M.; Lehn, J.-M., Helv. Chim. Acta, 2001, 84, 1694-1711.