

Solution equilibrium studies of lanthanides and actinides with hydroxamic siderophores

Michel MEYER¹, Stéphane BRANDES¹, Tamas FODOR¹, Alejandra SORNOSA-TEN¹,
Christine STERN¹, Shanthilal AMARASINGHE¹, Pawel JEWULA¹, Jean-Claude
CHAMBRON², Vladimir SLADKOV³, Frédéric COPPIN⁴, Lauréline FEVRIER⁴

¹ Institut de Chimie Moléculaire de l'Université de Bourgogne (ICMUB), UMR 6302 CNRS,
Université de Bourgogne-Franche-Comté, 9 avenue A. Savary, 21078 Dijon, France

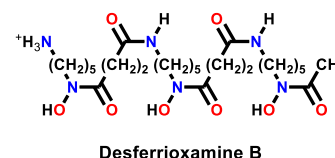
² Institut de Chimie de Strasbourg (ICS), UMR 7177 CNRS, Université de Strasbourg, 1 rue B. Pascal,
67008 Strasbourg, France

³ Institut de Physique Nucléaire d'Orsay (IPNO), UMR 8608 CNRS, Université Paris Sud, 15 rue G. Clemenceau,
91406 Orsay, France

⁴ Institut de Radioprotection et de Sécurité Nucléaire (IRSN/PRP-ENV/SERIS/L2BT), Centre d'Etudes de Cadarache,
13115 St Paul lez Durance, France

e-mail: michel.meyer@u-bourgogne.fr

Siderophores are ubiquitous microbial high-affinity iron(III) chelators excreted under iron-stress conditions. Their primary biological role is to supply microorganisms with iron, an essential nutrient and growth factor, according to an energy-driven mechanism involving specific outer-membrane receptors. Hydroxamates are common bidentate chelating groups found in many siderophores, such as the emblematic desferrioxamine B.



As their concentration in soils is typically in the $\mu\text{g}/\text{kg}$ range, these compounds might significantly increase the solubility, migration rate, and bioavailability of highly toxic metals in case of environmental contamination. In relation to the management and remediation of contaminated fields or the disposal of nuclear wastes in geological repositories, it is of utmost importance to gain a deeper understanding of the coordination chemistry of lanthanides and actinides by siderophores. The speciation of desferrioxamine B and model compounds with 4f and 5f elements will be discussed on light of potentiometric, capillary zone electrophoretic, and spectroscopic data (UV-vis, luminescence, IR, Raman, X-ray absorption, mass, ¹⁷O NMR).

References

- [1] P. Jewula, J.-C. Berthet, J.-C. Chambron, Y. Rousselin, P. Thuéry, M. Meyer, *Eur. J. Inorg. Chem.* **2015**, 1529–1541.
- [2] S. Brandès, A. Sornosa-Ten, Y. Rousselin, M. Lagrelette, C. Stern, A. Moncomble, J.-P. Cornard, M. Meyer, *J. Inorg. Biochem.* **2015**, *151*, 164–175.
- [3] A. Sornosa-Ten, P. Jewula, T. Fodor, S. Brandès, V. Sladkov, Y. Rousselin, C. Stern, J.-C. Chambron, M. Meyer, *New J. Chem.* **2018**, *42*, 7765–7779.
- [4] T. Terencio, J. Roithová, S. Brandès, Y. Rousselin, M.-J. Penouilh, M. Meyer, *Inorg. Chem.* **2018**, *57*, 1125-1135.

Acknowledgements

The Centre National de la Recherche Scientifique (CNRS), the Conseil Régional de Bourgogne (CRB, program PARI II CDEA), the European Regional Development Fund (FEDER), the program "Défi NEEDS Environnement", and the Agence Nationale de la Recherche are acknowledged for their financial support.