Volume: 14
Year: 2025
ISSN: 2239-2459

ISMEC GROUP SERIES
Symposium Edition: XXXV
https://www.ismecgroup.org/ismec-acta/

Acta of the International Symposium on Thermodynamics of Metal Complexes

The **Acta of the International Symposium on Thermodynamics of Metal Complexes 2025** (ISSN: 2239-2459) is published annually online open access by the **ISMEC Group**.

Editors:

Montserrat López-Mesas (President of the ISMEC Group)

Department of Chemistry (GTS)

Unversitat Autònoma de Barcelona

Facultat de Ciències, 08193 Bellaterra (Cerdanyola del Vallès), SPAIN

montserrat.lopez.mesas@uab.cat

Alicia Domínguez-Martín (Chair of the Organizing Committee ISMEC 2025)

Department of Inorganic Chemistry

University of Granada

Campus Cartuja s/n 18071 Granada, SPAIN

adominguez@ugr.es

Acta of the International Symposia on Metal Complexes

ISMEC GROUP SERIES, VOLUME: 14, YEAR: 2025

ISSN: 2239-2459

https://www.ismecgroup.org/ismec-acta/

International Scientific Committee of ISMEC 2025:

Montserrat López-Mesas	Universitat Autònoma de Barcelona, Spain President of ISMEC Group
Natalia Busto	Universidad de Burgos, Spain Deputy president of ISMEC Group
Demetrio Milea	Università degli Studi di Messina, Italy Former president of ISMEC Group
Antonio Bianchi	Università degli Studi di Firenze, Italy
Elzbieta Gumienna-Kontecka	Uniwersytet Wrocławski, Poland
Enrique García-España	Universitat de València, Spain Chair of ISMEC 2022
Vieri Fusi	Università di Urbino, Italy Chair of ISMEC 2023
Maria Rosa Beccia	Université Côte d'Azur, France Chair of ISMEC 2024
Alicia Domínguez Marín	University of Granada, Spain Chair of ISMEC 2025
Andrea Melchior	University of Udine, Italy Chair of ISMEC 2026

Local Organizing Committee of ISMEC 2025

Alicia Domínguez Martín
University of Granada, Spain. Chair of ISMEC 2025

Juan Niclós-Gutiérrez
University of Granada, Spain. Co-Chair of ISMEC 2025

Duane Choquesillo Lazarte
Consejo Superior de Investigaciones Científicas, Spain

Ricardo Navarrete Casas
University of Granada, Spain

Miguel Ángel Galindo Cuesta
University of Granada, Spain

Cristobal Verdugo Escamilla
Consejo Superior de Investigaciones Científicas, Spain

Jeannette Carolina Belmont Sánchez
University of Granada / Consejo Superior de Investigaciones Científicas, Spain

Estephany Muñoz Hernández
University of Granada / Consejo Superior de Investigaciones Científicas, Spain

Francisco Javier Acebedo Martínez
Consejo Superior de Investigaciones Científicas, Spain

Joaquín Criado Reyes
Consejo Superior de Investigaciones Científicas, Spain

Metal Ions And Peptides – A Bioinorganic Symphony For Antimicrobial Action

Magdalena ROWIŃSKA-ŻYREK,[a)] Joanna WĄTŁY,[a)] Klaudia SZARSZOŃ,[a)] Adriana MILLER,[a)] Joanna OLESIAK-BAŃSKA,[b)] Daniela VALENSIN,[c)] Arian KOLA,[c)] Denise BELLOTTI,[d)] Maurizio REMELLI,[d)] Agnieszka MATERA-WITKIEWICZ[e)]

[a)] Faculty of Chemistry, University of Wrocław, F. Joliot-Curie 14, 50-383 Wrocław, Poland
[b)] Department of Chemistry, Wrocław University of Science and Technology, Wybrzeże Wyspiańskiego 27, 50-370 Wrocław, Poland
[c)] Department of Biotechnology, Chemistry and Pharmacy, University of Siena, Via A. Moro 2, 53100 Siena, Italy
[d)] Department of Chemical, Pharmaceutical and Agricultural Sciences, University of Ferrara, located at Via Luigi Borsari 46, 44121 Ferrara, Italy
[e)] Laboratory for Screening Biological Activity Assays and Collection of Biological Material, Faculty of Pharmacy, Wrocław Medical University, ul. Borowska 211, 50-556 Wrocław, Poland
magdalena.rowinska-zyrek@uwr.edu.pl

Unraveling how metal ions influence antimicrobial peptides (AMPs), our work offers new insights that may contribute to the field of beautiful, fundamental bioinorganic chemistry. We show that coordination of Zn(II) and Cu(II) ions to AMPs can significantly enhance their antimicrobial activity by modulating peptide structure, morphology, and local charge.[1]
Our project revealed, for the first time, that Zn(II) binding to amyloidogenic peptides such as pramlintide, amylin analogs, and shepherin induces the formation of amyloid fibrils, which appear to underlie their potent antifungal effects. This "coordination-induced fibrillization" proceeds via a clear trajectory: distal metal binding → structural rearrangement → fibril formation → antifungal activity. This insight introduces a new perspective on the role of functional amyloids in antimicrobial action.[2]
In the case of piscidins or semenogelins, we show that their antimicrobial effect arises from the locally cationic character of their metal complexes, which promotes interactions with negatively charged microbial membranes.[3,4]
Together, these findings deepen our understanding of metal-peptide interactions and may offer a foundation for the rational design of metal-based antimicrobial strategies. By bridging molecular coordination chemistry with mechanisms of microbial resistance, we hope to take one tiny small step toward addressing a major medical challenge.

References:

[1] A. Miller, A. Matera-Witkiewicz, A. Mikołajczyk-Tarnawa, A. Kola, M. Wiloch, M. Jonsson-Niedziolka, R. Wieczorek, J. Wątły, D. Valensin, M. Rowińska-Żyrek, *Chemical Science*, **2025**, 16, 3447-3458

[2] J. Wątły, K. Szarszoń, A. Mikołajczyk, M. Grelich-Mucha, A. Matera-Witkiewicz, J. Olesiak-Bańska, M. Rowińska-Żyrek, *Inorganic Chemistry*, **2023**, 62, 19786-19794

[3] E. Dzień, J. Wątły, A. Hecel, A. Mikołajczyk, A. Matera-Witkiewicz, M. Adrover, M. Barceló-Oliver, A. Domínguez-Martín, M. Rowińska-Żyrek, *Dalton Transactions*, **2024**, 53, 19202-19213

[4] A. Miller, A. Mikołajczyk, D. Bellotti, K. Garstka, J. Wątły, A. Hecel, R. Wieczorek, A. Matera-Witkiewicz, M. Rowińska-Żyrek, *Inorganic Chemistry*, **2024**, 63, 12958-12968