11th of March 2026

12:00
Sala de Conferencias
I+D+I building, Campus Rio Ebro

Dissipative self-assembly & wall-less fluidics

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About the speaker: Thomas Hermans is Senior Research Professor at IMDEA Nanociencia (Madrid, Spain) since December 2023. He earned his PhD in Biomedical Engineering at TU Eindhoven (NL) and conducted postdoctoral research at Northwestern University (USA) before starting his independent group at Université de Strasbourg (FR, 2013–2023). Notable funding includes the ERC Starting & Consolidator, ATRAE, and Caixa Health, which allows diverse research on out-of-equilibrium supramolecular systems and innovative fluidics, which led to 2 start-up companies.

Abstract:

Dissipative Self-assembly. Actin or microtubule (MT) cytoskeletal networks, achieve dynamics as well as supramolecular structures with the same protein building blocks. In other words, the components can assemble, but also react, which in turn affects the assemblies. Here, I present recent[1–6] chemical reaction networks from our group, where interesting emergent behaviors were found, such as supramolecular size oscillations, traveling polymerization, or transient assembly.

Wall-less fluidics. We develop magnetically levitated “liquid tubes”[7] as a new fluidic paradigm. Specifically, we use permanent magnets to wrap a ferrofluid around a second non-magnetic liquid, thus avoiding any solid wall in the entire fluidic device. In this way we can achieve 60–99% reduced drag,[8] plug flow,[9] and ultra-soft walls (2–10 kPa)[10]. I show applications in flow chemistry[11] and in blood pumping[12].

[1] N. Singh et al. J. Am. Chem. Soc. 2020, 142, 4083–4087. [2] J. Leira-Iglesias, et al. Nat Nanotechnol. 2018, 13, 1021. [3] N. Singh, et al. J. Am. Chem. Soc. 2022, 144, 410–415. [4] A. Sharko, et al. Chem. Rev. 2022, 122, 11759–11777. [5] C. Chen, et al. Chemistry A European J 2023, 29, 202202849. [6] A. Sharko, et al. J. Am. Chem. Soc. 2023, 145, 9672–9678. [7] P. Dunne, et al. Nature 2020, 581, 58–62. [8] A. A. Dev, et al. Langmuir 2022, 38, 719–726. [9] A. A. Dev, et al. 2024, arXiv.2402.16510. [10] A. A. Dev, et al. Adv. Funct. Mater. 2024, 2411811. [11] A. Mata, et al. Org. Process Res. Dev. 2025, 29, 472–478. [12] M. Zolala, et al. J Transl Med 2026.

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