FUEL-DRIVEN ACTIVE MATERIALS

J.H. van Esch [1*], R. Eelkema, [1] G. Koper, [1] W. Hendriksen, [1] J. Boekhoven, [1] J. Poolman, [1] A. Olive, [1] M. Lovrak, [1] C. Maity, [1] S. van Rossum[1]

Department of Chemical Engineering, Delft University of Technology, Delft, The Netherlands
*j.h.vanesch@tudelft.nl

ABSTRACT

It remains a huge scientific challenge to understand and mimic the utilisation of chemical energy in biological systems to achieve the highly adaptable organisation and sophisticated functions like active transport, motility, self-repair, replication, and adaptability. The development of biomimetic systems with similar energy consuming organisation and functions requires a radical departure from equilibrium self-assembly approaches, towards out-of-equilibrium systems driven by the continuous input of energy.

In our research, we focus on the development of active materials driven by chemicals fuels. First, I will discuss how active materials can result from the transient self-assembly of synthetic molecules, driven by the consumption of a chemical fuel. In these materials, reaction rates and fuel levels, instead of equilibrium composition, determine properties such as lifetime, stiffness, and self- regeneration capability.[1-3] Then, I will discuss our recent steps to achieve temporal and spatial over fuel-driven self-assembly by the development of a chemical reaction network that allow for feedback control. Such systems will form the basis for self-organising systems and for design and construction of energy-consuming dynamic devices and materials.

References:

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