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Swimming modes & interactions of anisotropic active colloids

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Stellingen

Behorende bij het proefschrift

Swimming Modes & Interactions of Anisotropic Active Colloids

- I. In self-propelled particles with shapes continuously tunable between spheres and rods, cluster formation is optimal for bent rods with an opening angle of 180° .
Chapter 2 of this thesis
- II. The propulsion direction in catalytic active particles can change with increasing fuel concentration when the microswimmer possesses an anisotropic shape.
Chapter 3 of this thesis
- III. The geometric shape and size of the key particle strongly influences the overall lock-and-key clustering behavior which provides insights into the stability of individual pairs.
Chapter 4 of this thesis
- IV. The collective rotation of a bound pair plays a critical role in determining lock-and-key pairing as well as crescent-crescent pair longevity.
Chapter 2 and 4 of this thesis
- V. For 3D-microprinting to become a widespread fabrication technique for anisotropic colloids used in phase behavior experiments, challenges in resolution and printing speed have to be resolved.
Kiefer et al. *Light: Advanced Manufacturing* (2024)4:3
- VI. The combination of chemical polarity and shape-dependent solute diffusion explains the different swimming directions for prolate, oblate and spherical particles as well as the fuel concentration-coupled behavior of crescent-shaped microswimmers observed in Chapter 3.
S. Michelin and E. Lauga, *Scientific Reports* **7**, 42264 (2017)
- VII. Introducing error correction mechanisms in active colloidal assemblies will pave the way to the design of structures with complexity similar to those found in biology.
C. Sharma and A. Walther, *Angew. Chem. Int. Ed.* **61**, e202201573 (2022)
Q. Zhu, et al., *Phys. Rev. Research* **6**, L042057 (2024)
- VIII. The field of active matter is increasingly evolving into an engineering discipline.
K. M. Kreienbrink, et al., *Nat. Commun.* **16**, 6062 (2025)
- IX. A good supervisor has a greater impact on your motivation than the content of your research.
- X. Combining work and parenthood should be recognized more for what it truly is: a significant achievement that requires resilience, adaptability and commitment.

Solenn Riedel

Leiden, 10th July 2026