



Universiteit
Leiden
The Netherlands

Synthetic model microswimmers near walls

Ketzetzi, S.

Citation

Ketzetzi, S. (2021, June 29). *Synthetic model microswimmers near walls. Casimir PhD Series*. Retrieved from <https://hdl.handle.net/1887/3185906>

Version: Publisher's Version

License: [Licence agreement concerning inclusion of doctoral thesis in the Institutional Repository of the University of Leiden](#)

Downloaded from: <https://hdl.handle.net/1887/3185906>

Note: To cite this publication please use the final published version (if applicable).

Cover Page



Universiteit Leiden



The handle <http://hdl.handle.net/1887/3185906> holds various files of this Leiden University dissertation.

Author: Ketzetzi, S.

Title: Synthetic model microswimmers near walls

Issue date: 2021-06-29

SYNTHETIC MODEL MICROSWIMMERS NEAR WALLS

Proefschrift

ter verkrijging van
de graad van doctor aan de Universiteit Leiden,
op gezag van rector magnificus prof. dr. ir. H. Bijl,
volgens besluit van het college voor promoties
te verdedigen op dinsdag 29 juni 2021
klokke 11.15 uur

door

Stefania Ketzetzi

geboren te Thessaloniki (Griekenland)
in 1989

Promotores

Dr. D. J. Kraft

Prof. dr. M. L. van Hecke

Promotiecommissie

Prof. dr. D. A. Wilson (Radboud Universiteit)

Prof. dr. M. A. G. J. Orrit

Prof. dr. E. R. Eliel

Dr. J. de Graaf (Universiteit Utrecht)

Dr. A. Morin

Casimir PhD Series, Delft-Leiden 2021-10

ISBN 978-90-8593-476-9

The work described in this dissertation was supported by the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation program (grant agreement no. 758383).

The cover shows a Janus colloid, a microscopic particle whose surface consists of two distinct hemispheres. One hemisphere is nonmetallic while the other is covered with the metal platinum. The name *Janus* comes from the two-faced god of Roman mythology. This work studies the self-propelled motion of these colloids near walls. Special thanks goes to Rachel Doherty for scanning electron microscopy imaging and to Ruben Verweij for help with cover preparation.

"A friend of mine (Albert R. Hibbs) suggests a very interesting possibility for relatively small machines. He says that, although it is a very wild idea, it would be interesting in surgery if you could swallow the surgeon. You put the mechanical surgeon inside the blood vessel and it goes into the heart and "looks" around. It finds out which valve is the faulty one and takes a little knife and slices it out."

Richard Feynman, *Plenty of Room at the Bottom*, Pasadena, 1959

To my brother.

Contents

1	Introduction	1
2	Wall-Dependent Propulsion Speeds	27
3	Diffusion-Based Analysis for Wall Distance Determination	53
4	Activity-Induced Interactions Along One-Dimensional Paths	81
5	Holography as a Probe for Near-Wall Colloid Dynamics	105
6	Self-Propulsion of Symmetric and Asymmetric Dumbbells	131
7	Conclusions and Outlook	147
	Bibliography	155
	Summary	185
	Samenvatting	191
	Acknowledgements	195
	List of Publications	197
	About the author	199

