

Master Internship

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Title: Active particle-Membrane interaction and dynamics

Interaction of microparticles to biological membranes plays a determinant role in many important processes such as viral infections, drug delivery and toxicity from nanomaterials. For particle sizes in the micron range, membrane wrapping of the particles depends on particle (surface charge, surface coating, particle shape and size) and membrane properties (tension, curvature and charge).¹ Many theoretical models have been developed in the last decades. However, few experimental investigations have been reported on the different transitions that microparticles may undergo when they come into contact with biological or biomimetic membranes.^{2,3,4} Microparticles can become completely (C) or partially (P) engulfed by the membrane if the adhesion energy overcomes the stretching and bending costs of the membrane, see Figure. This internship is dedicated to study the microparticle engulfment by lipid membranes by tuning the Janus geometry of the microparticles and the particle activity leading to self-propulsion. A successful Master student may access to a PhD funded by ANR on a related topic starting from October 2022.

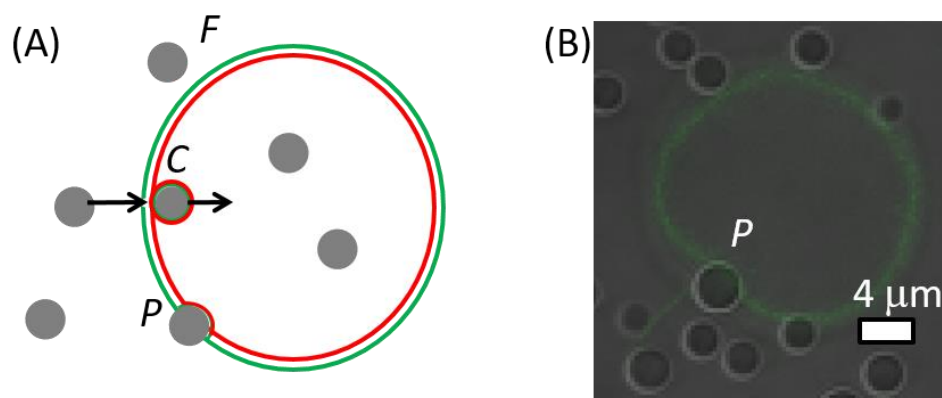


Figure 1. (A) Free (F), completely (C) or partially (P) engulfed states of microparticles by a membrane. (B) Fluorescent/Bright field optical microscopy image of silica colloids interacting with a fluorescently labelled (DOPC) lipid membrane.

REFERENCES:

- 1 S. Zhang, H. Gao and G. Bao, *ACS Nano*, 2015, **9**, 8655–8671.
- 2 K. Shigyou, K. H. Nagai and T. Hamada, *Langmuir*, 2016, **32**, 13771–13777.
- 3 C. Dietrich, M. Angelova and B. Pouligny, *J. Phys. II*, 1997, **7**, 1651–1682.
- 4 R. W. Jagers and S. A. F. Bon, *Soft Matter*, 2018, **14**, 6949–6960.