Condensed Matter > Soft Condensed Matter

Dynamical membrane curvature instability controlled by intermonolayer friction

Anne-Florence Bitbol, Jean-Baptiste Fournier, Miglena I. Angelova, Nicolas Puff

(Submitted on 10 Jul 2011)

We study a dynamical curvature instability caused by a local chemical modification of a phospholipid membrane. In our experiments, a basic solution is microinjected close to a giant unilamellar vesicle, which induces a local chemical modification of some lipids in the external monolayer of the membrane. This modification causes a local deformation of the vesicle, which then relaxes. We present a theoretical description of this instability, taking into account both the change of the equilibrium lipid density and the change of the spontaneous membrane curvature induced by the chemical modification. We show that these two types of changes of the membrane properties yield different dynamics. In contrast, it is impossible to distinguish them when studying the equilibrium shape of a vesicle subjected to a global modification. In our model, the longest relaxation timescale is related to the intermonolayer friction, which plays an important part when there is a change in the equilibrium density in one monolayer. We compare our experimental results to the predictions of our model by fitting the measured time evolution of the deformation height to the solution of our dynamical equations. We obtain good agreement between theory and experiments. Our fits enable us to estimate the intermonolayer friction coefficient, yielding values that are consistent with previous measurements.

Comments:	25 pages, 10 figures
Subjects:	**Soft Condensed Matter (cond-mat.soft)**; Biological Physics (physics.bio-ph)
Journal reference:	J. Phys.: Condens. Matter 23, 284102 (2011)
DOI:	10.1088/0953-8984/23/28/284102
Cite as:	**arXiv:1107.1854v1 [cond-mat.soft]**

Submission history

From: Anne-Florence Bitbol [view email]
[v1] Sun, 10 Jul 2011 13:11:51 GMT (5690kb)

Which authors of this paper are endorsers?