Supported lipid bilayer destabilization by an electric field

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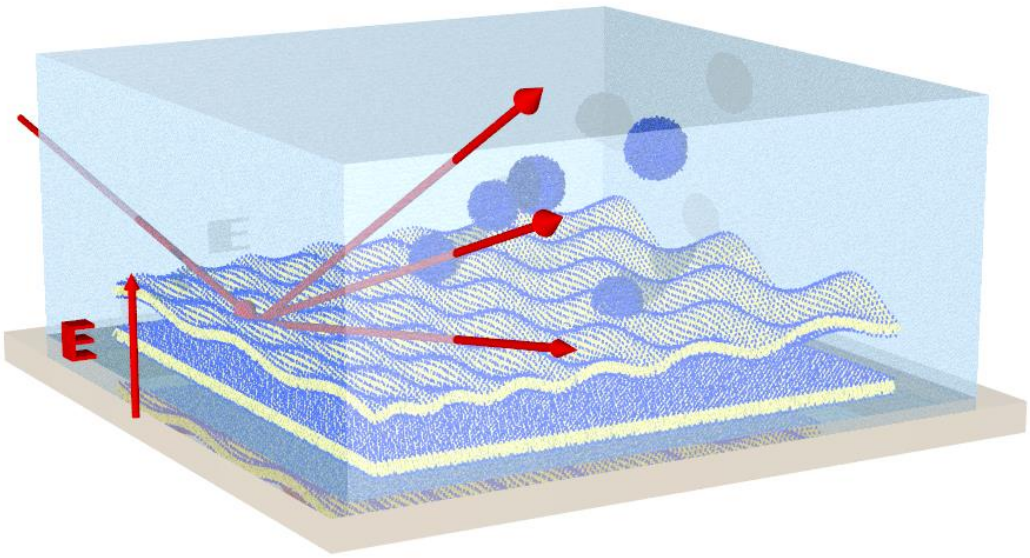
Abstract

For many biotechnological applications it is crucial to better understand the effects of electric fields on lipid membranes. As an example, supported bilayer destabilization by an electric field is widely used to form Giant Unilamellar Vesicles. Understanding the underlying mechanism requires measurements on well-controlled systems close to natural conditions, in which fluctuations play an important role.

By combining original model system (floating bilayer)[1] and high-resolution grazing incidence x-ray scattering we were recently able to fully characterize the fluctuations spectrum of a single bilayer[2,3]. We applied this technique to measure the effects of an electric field on the properties of membranes. We show that the field induces a negative electrostatic tension and a significant increase of the bending rigidity, as predicted by recent theories[4]. We investigate both the effect of electric field frequency and amplitude and compare it to electrokinetic model. Finally, we were able to demonstrate that the floating bilayer destabilization lead to the formation of well defined vesicles.



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