Two dimensional control of charged molecules in lipid bilayer membranes by an electric field

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In cell membranes, reorganization of membrane components such as lipids and proteins plays an important role in membrane deformation, vesicle budding, and signal transduction. Such reorganization in a model membrane, for example, a supported lipid bilayer (SLB), has been demonstrated using a topographic structure [1] or an electric field [2] in a systematic way. Particularly, an electric field provides an active way of controlling charged molecules in membranes. In this work, we show how an electric field can be used for structurally organizing charged lipids in two-dimension. In Fig. 1, a schematic diagram of transporting the charged molecules in the SLB from one region (region 1) to the other (region 3) was shown in the presence of an external electric field (*E*). A two-dimensional version extended from one-dimensional theory [3] was found to describe well the transport and distribution of charged lipids produced by the external electric field. Our approach would provide a useful platform to study cell growth and adhesion, and membrane proteins-associated phenomena.

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Reference

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[3] Groves, J. T., Boxer, S. G., McConnell, H. M, PNAS, **1997** , 94, 13390-13395

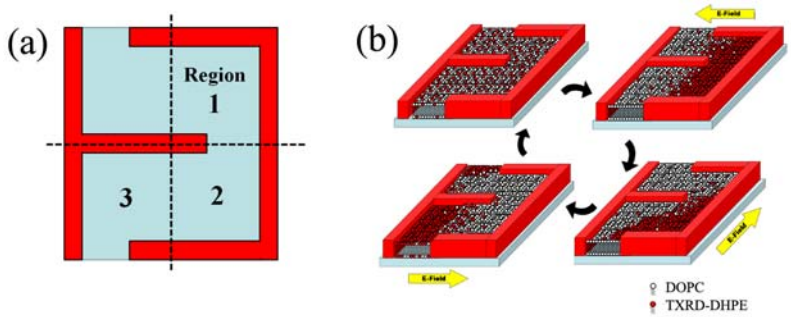

Figure 1. Schematic diagram of transporting charged lipids in a SLB: (a) patterned barriers and (b) transport and distribution of charged lipids in the presence of an external field *E*.