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Measuring Surface Potential of Zwitterionic Lipid Bilayers with Atomic Force Microscope YI YANG, KATHRYN MAYER, JASON HAFNER, Rice University — Electrostatic potential was measured near supported zwitterionic lipid bilayer membrane surfaces with atomic force microscope. In our recent work, two methods were developed to measure the surface charge density of the membrane surface, Fluid electric force microscopy (FEFM) which creates a two- dimensional map of a surface charge density with a corresponding topographic map simultaneously and quantitative measurement method which based on tip-sample force curve analysis.Both FEFM and tip-sample force curve analysis showed that the surface of a DOPC (dioleoylphosphatidylcholine) lipid bilayer carries a negative electrostatic potential.This is an interesting and surprising result, for the head group of DOPC is carrying zero net charge over a broad range of pH where both the choline and phosphate groups are ionized.Two sources are proposed to explain the origin of this negative charge.The bilayers could carry a net charge density due to the counterions from the electrolyte binding to the lipid head groups.Alternatively, the dipole density in the DOPC lipid head group layer could cause an effective surface potential outside the membrane region.To study the source of this negative potential, Charge densities of supported DOPC bilayers under different ion concentrations were measured and compared with both of these two charge mechanisms.

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