Abstract Submitted
for the DFD12 Meeting of
The American Physical Society

A transient solution and scaling laws for vesicle electrodeformation and relaxation[1] HAO LIN, JIA ZHANG, JEFFEREY ZAHN, Rutgers University — A transient analysis for vesicle deformation and relaxation under DC electric fields is presented. The theory extends from a droplet model developed by us, with the additional consideration of a lipid membrane separating two fluids of arbitrary properties. For the latter, both a membrane-charging and a membrane-mechanical model are supplied. The main result is an ODE governing the evolution of the vesicle aspect ratio. The model prediction is extensively compared with experimental data, and is shown to accurately capture the system behavior. More importantly, the comparison reveals that vesicle relaxation obeys a universal behavior regardless of the means of deformation. The process is governed by a single timescale that is a function of the vesicle initial radius, the fluid viscosity, and the initial membrane tension. This universal scaling law can be used to calculate membrane properties from experimental data.

[1]NSF award CBET-0747886

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Date submitted: 03 Aug 2012 Electronic form version 1.4