Equilibrium electrodeformation of a vesicle in an ac electric field

YUAN-NAN YOUNG, HERVE NGANGUIA, New Jersey Institute of Technology —
Under an ac electric field the equilibrium shape of a vesicle (closed liposome) depends
on various physical parameters, such as the electric field frequency, mismatch in
fluid conductivities and permittivities. In this work we use a spheroidal model to
investigate these dependences. We derive the transmembrane potential for a leaky
dielectric spheroidal shell and compute the equilibrium spheroidal shape. When
compared with experiments and previous small-deformation analysis, we found that
the spheroidal model agrees better with the experiments. In particular the spheroidal
model allows for asymptotic analysis on the cross-over frequency between prolate
and oblate vesicles, and the comparison with experiments near the cross-over shows
that the spheroidal model captures the prolate-oblate transition better than the
small-deformation theory.

Yuan-Nan Young
New Jersey Institute of Technology