

Influence of membrane composition on its flexibility

Bárbara Bianca Gerbelli
Universidade de São Paulo

DOI: <https://doi.org/10.5196/physicae.proceedings.XIYRM.26>

Resumo

Lamellar phases and vesicles composed of lipids have been used as model systems to investigate biological process related to cell membrane as well as promising carriers for drugs and gene therapy. The composition of the membrane determines its three dimensional shape and its properties such as rigidity and compressibility which play an important role on membrane fusion, protein adhesion, interactions between proteins, etc. We present systematic study of a lamellar system composed mainly of lecithin which is a biocompatible phospholipid and simulsol, which is a mixture of fatty acids and acts as a co-surfactant introducing flexibility to the membrane. Using X ray scattering we determine the lamellar periodicity as a function of the hydration for two different formulations of the membrane; with 70% and 30% mass fraction of simusol, respectively. The X ray spectra are fitted using a simple model that allows us to determine the lamellar periodicity and the Caillé parameter [1, 2]. The ideal swelling law relating the membrane volume fraction (δ_m) to the lamellar periodicity (D) is given by $\delta_m = \varphi_m / D$, where φ_m is the thickness membrane, however, when steric interactions are dominant with respect to electrostatic and van der Waals interactions, deviations from this behavior are expected [3]. We present experimental data illustrating the swelling behavior for the two membrane compositions and the respective behavior of the Caillé parameter, which is related to the bending rigidity (k) and compressibility modulus of the membrane (B).