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Homogenization of DPPC phospholipid bilayers deposited from their vapor phase onto single-crystal silicon substrates through annealing under different conditions (air, N2, and vacuum)

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In this study at SurfLab Instituto de Física UC, the homogenization of dipalmitoylphosphatidylcholine (DPPC) phospholipid bilayers deposited from their vapor phase on single crystal silicon substrates was investigated. The main objective was to evaluate the effect of different annealing conditions on the homogeneity of the bilayers, using air, dry nitrogen (N2) environment at different pressures, and vacuum. Previously, at Surflab, the topographies of samples were studied after subjecting them to temperature ramps using air [1]. First, DPPC bilayers were deposited on single crystal silicon substrates by physical vapor deposition (PVD) with in situ control of the deposited thickness and deposition rate. Subsequently, the samples were annealed in different environments. First, annealing was performed in air, where the temperature and treatment time were controlled. Next, annealing was performed in a nitrogen environment at different pressures with control of temperature and treatment time. Finally, annealing was performed under vacuum to compare to earlier results of our group on Alkane films and to eliminate any possible contamination or moisture present in the environment.

This study demonstrates that the annealing process, in addition to the deposition rate, plays a critical role in the homogenization of DPPC phospholipid bilayers deposited on single crystal silicon substrates. Annealing conditions in air, nitrogen environment at different pressures, and vacuum were found to have different effects on the homogeneity of the bilayers. These results are of great importance for the design and fabrication of devices based on phospholipid bilayers, such as sensors and biomimetic devices.

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References

[1] Cisternas M. et al. (2020), doi.org/10.3390/ijms21186819