ISCTYR 2022
International Symposium on Chemical Thermodynamics for Young Researchers (ISCTYR),
May 22-25, 2022, Laurino (Salerno), Italy

THERMODYNAMICS OF CELL MEMBRANES DRIVEN BY LIPID-LIPID INTERACTIONS: A CALORIMETRIC STUDY

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The functionality of cells, vesicles and membrane proteins is strictly correlated to membrane lipid composition because of its influence on membrane thermodynamic stability [1]. In this frame, a stepwise study of vesicles with different morphology and lipid composition was performed through high-sensitivity differential scanning calorimetry at physiological pH aiming at dissecting the main contributions to the thermodynamic stability of cell membranes. The phospholipid bilayer of the pancreatic Insulin Secretory Granules (ISGs) was considered as reference system.

The cross-study of single-component and binary systems with different phospholipid composition allowed to assess the roles played by curvature, phospholipid headgroups and tails on the thermotropic behaviour of cell membranes [2]. Consequently, a hierarchy of contribution to the overall thermodynamic stability of membranes was depicted as membrane curvature < phospholipid headgroup < phospholipid tail < phospholipid unsaturation. The following addition of different constituents allowed the achievement of a high-complexity model membrane that reflected the 80% of ISG's phospholipids [3].

Furthermore, the effect of several Free Fatty Acids (FFAs), whose levels are recurrently altered in diabetic and/or obese subjects, on the thermodynamic stability of selected membranes was investigated [2,3].

Keywords: model membranes; DSC; lipid interactions; free fatty acids.

References

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