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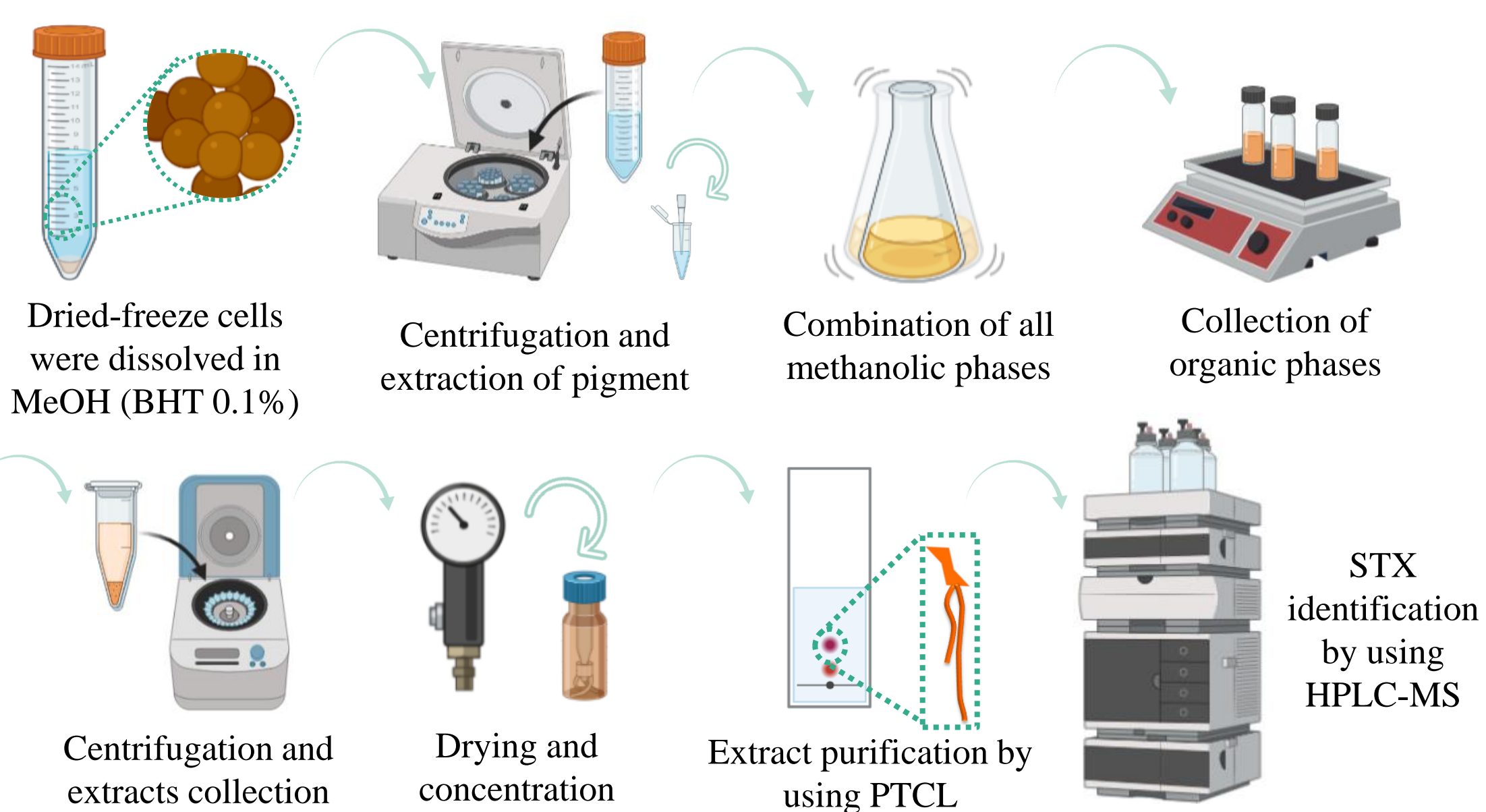
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Introduction

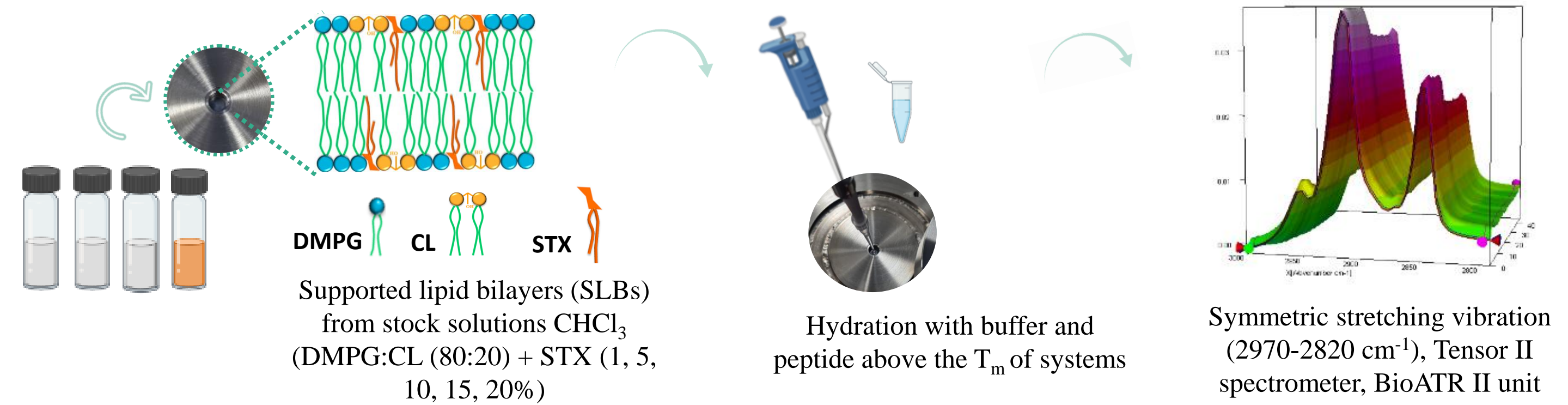
Staphylococcus aureus (*S. aureus*) is a Gram-positive bacteria considered one of the most frequent pathogens in hospitals.¹ One of the most interesting features of *S. aureus* is the synthesis of lipids as a response to external factors.² Recently, staphyloxanthin (STX) production has been associated with bacteria pathogenicity since it is related to a higher tolerance to oxidative stress and presumably it plays a role in regulating membrane properties.^{3,4} In this study was evaluated the effect of increasing concentrations of STX on the thermotropic properties of cell membrane models of *S. aureus*. Infrared spectroscopy and fluorescence spectroscopy were used to evaluate the effect on system phase-transition temperature (T_m), and the changes in fluidity, respectively.

Methodology

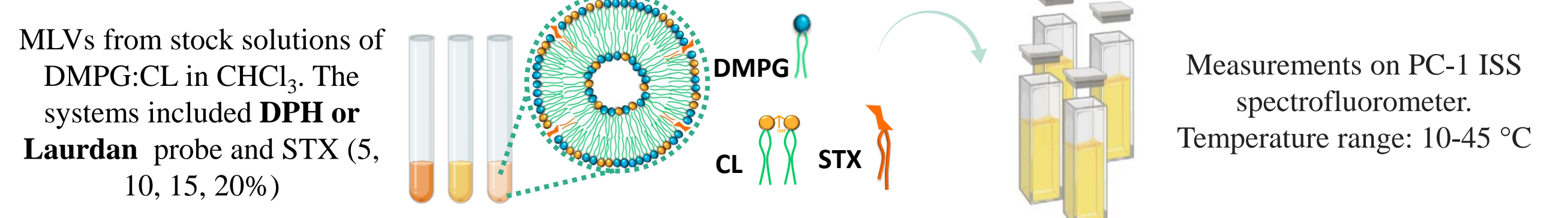
1 Extraction and Identification of Staphyloxanthin



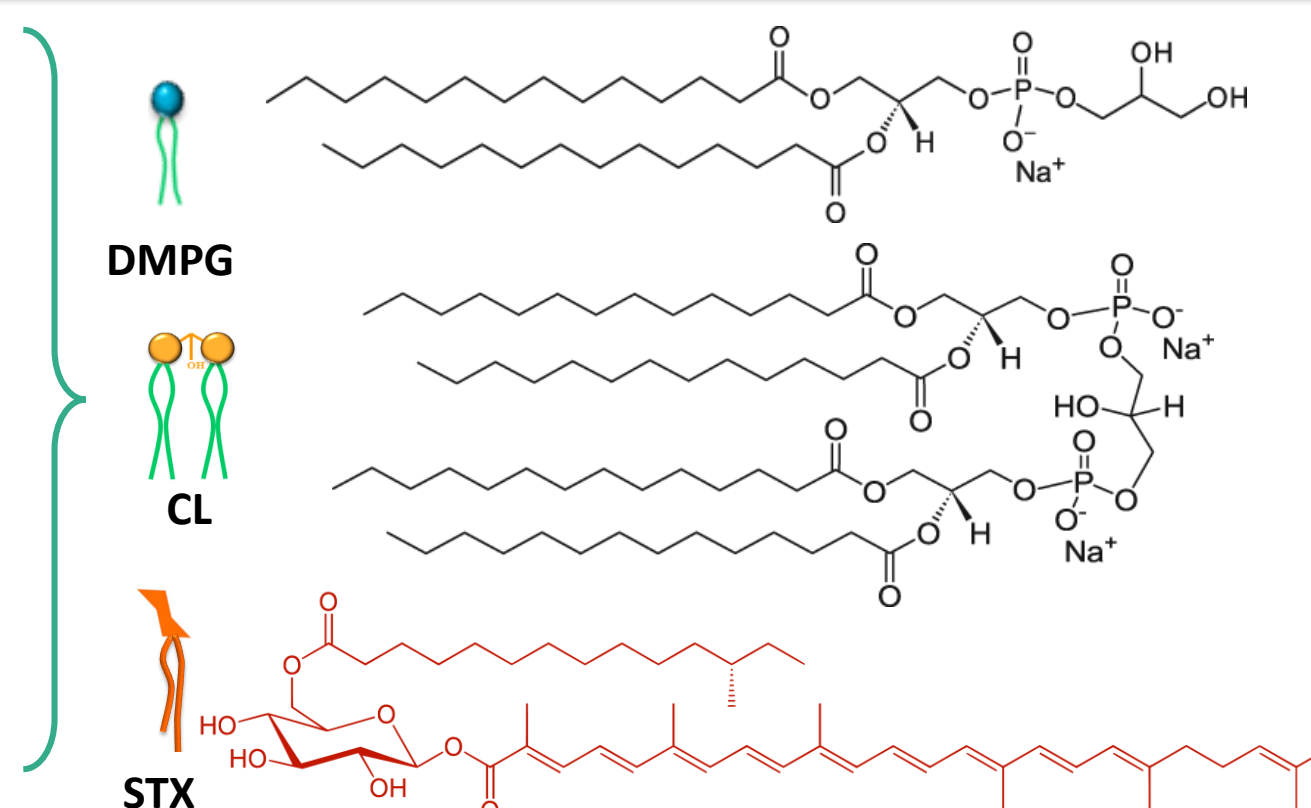
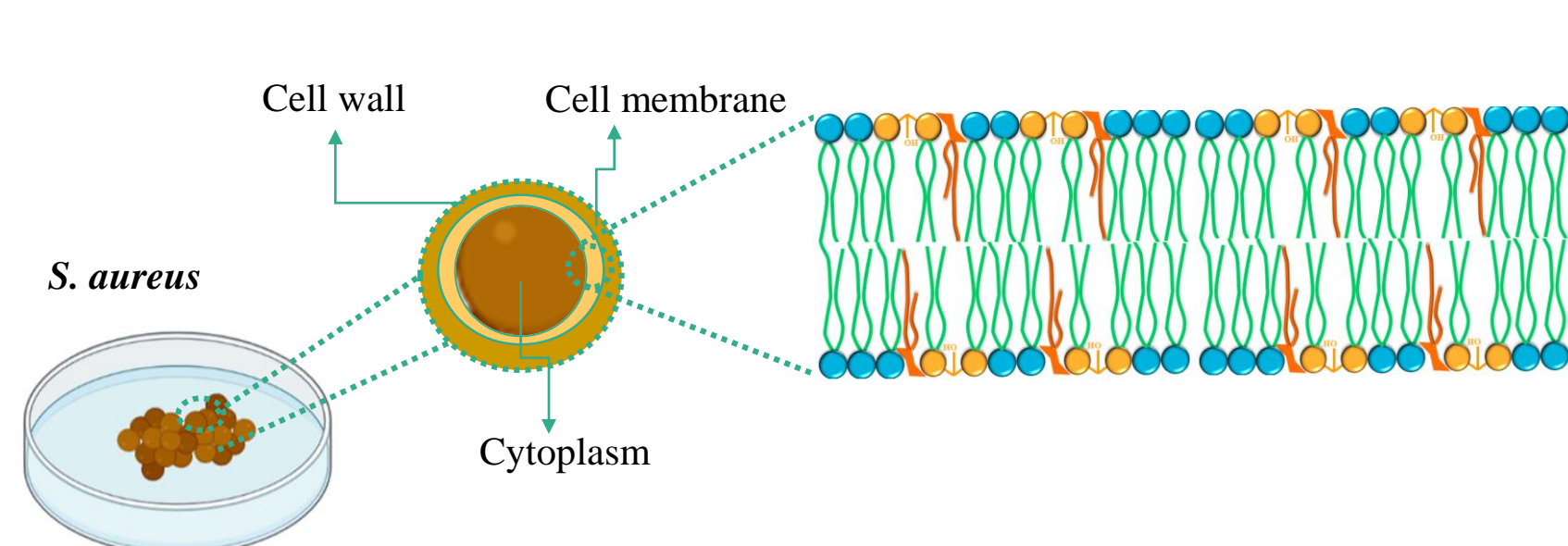
2 Transition temperature analysis by FT-IR



3 Anisotropy and GP measurements



Results and Discussion



For the *S. aureus* cell membrane, PG and CL appear to be the main phospholipids

STX is the main compound in the *S. aureus* total carotenoids. That molecule protects the microorganism from oxidative damage. Additionally, it modulates the cell membrane's physical properties, such as fluidity

Transition temperature (T_m) analysis by FT-IR

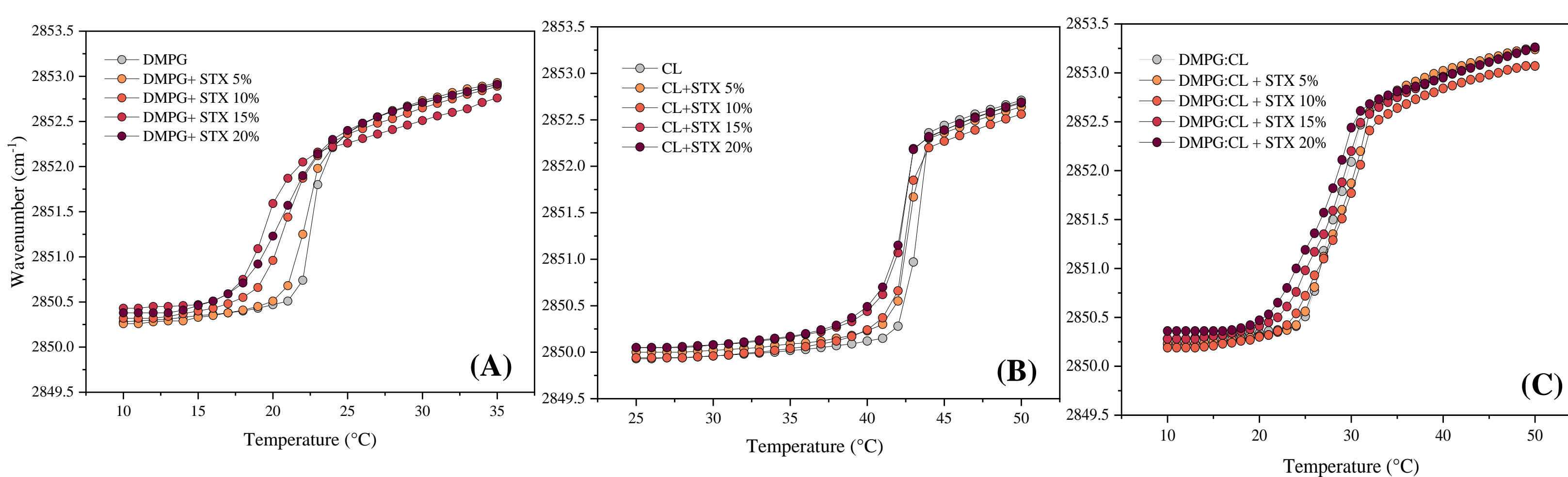


Figure 3. Peak positions of the νCH_2 vibrations bands of the methylene groups as functions of temperature in the presence of different concentrations of STX for (A) DMPG, (B) CL, (C) DMPG:CL (80:20) systems.

Table 1. Phase transition (T_m) temperatures, of the supported bilayers of DMPG, CL, and DMPG:CL (80:20) by FTIR. Standard deviations are ≤ 0.1 °C.

Lipids System/ Staphyloxanthin (mol %)	DMPG	CL	DMPG:CL
0	22.9	43.4	28.7
5	22.5	42.6	29.2
10	21.3	42.4	29.0
15	20.0	42.1	27.8
20	21.0	42.0	27.0

- Increasing concentrations of STX decrease the T_m values, especially for systems that include DMPG
- Presumably, the STX modifies the packing of hydrocarbon chains of phospholipids, which results in a phase gel disruption

Anisotropy measurements

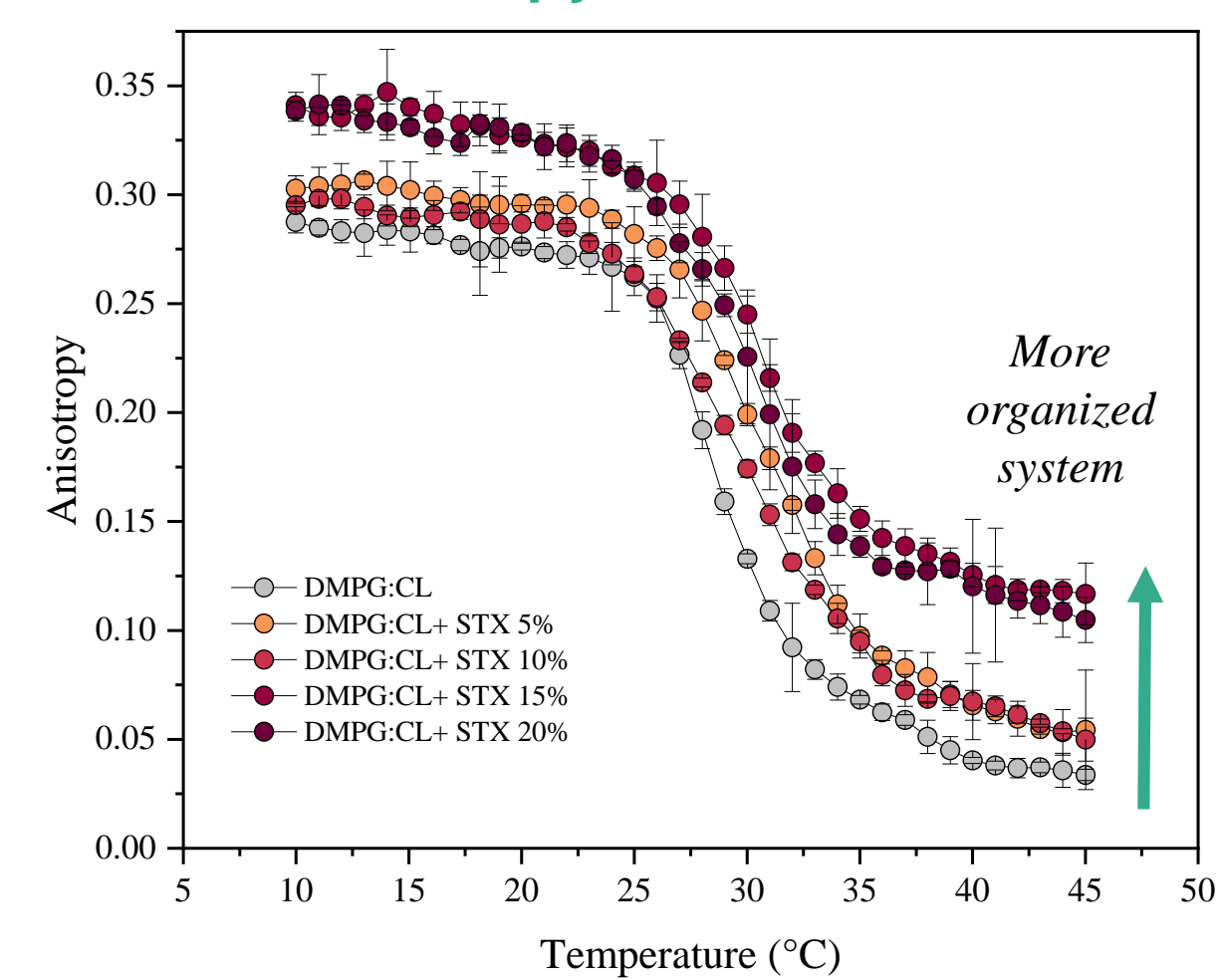


Figure 1. Thermotropic measurements of Anisotropy as temperature function

- The increment in concentrations of STX increases the lipid ordering in both liquid-crystalline and gel phases

GP Measurements

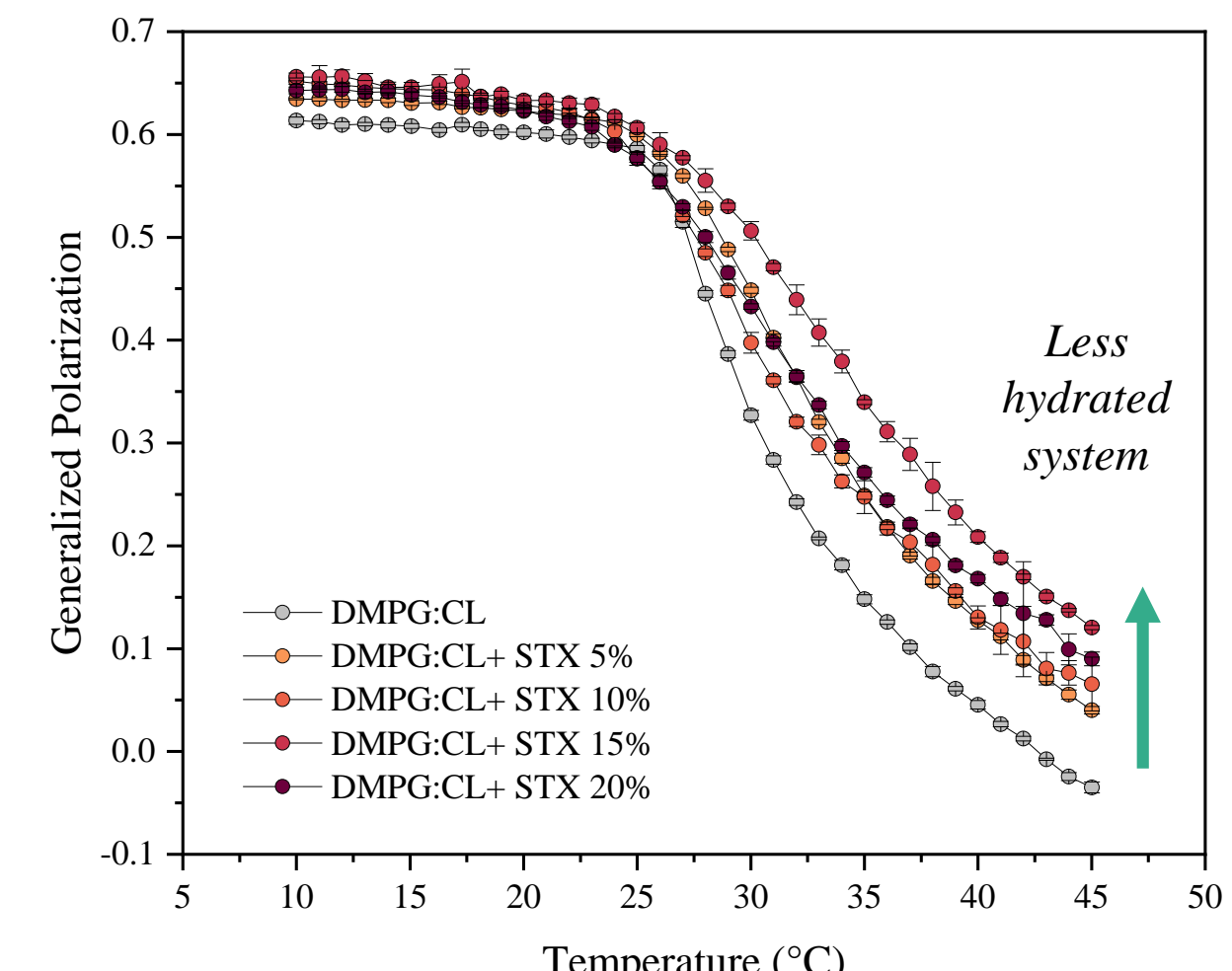


Figure 2. Thermotropic measurements of Laurdan Generalized Polarization as temperature function

- Systems hydration is slightly affected in the gel phase, while significant variations occurred in the liquid phase in increasing STX

Conclusions

- The incorporation of bacterial pigment STX on representative lipid models of *S. aureus* cell membranes influences the physical states of the systems.
- The gradual inclusion of STX in SLBs depresses the lipid phase transition through the organized phase disruption.
- Variation in anisotropy values as a function of the amount of STX shows that the pigment induces a strong effect in the hydrophobic core of the lipid systems.
- STX induces the condensation of polar groups in the liquid phase, evidenced by the change in GP values for representative membrane systems.

References

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