## Data Article

**Calorimetric monitoring data of the evolution of the lamellar-inverted hexagonal phase transition in phosphatidylethanolamine dispersions upon temperature cycling**

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### Abstract

The data presented in this article are related to the research article entitled "Cubic phases in phosphatidylethanolamine dispersions: formation, stability and phase transitions" (Tenchov and Koynova, 2017) [1]. This article presents thermodynamic data obtained by differential scanning calorimetry following the evolution of the \(L_\alpha - H_{II}\) endotherm upon temperature cycling during the lamellar to cubic phase conversion.

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### Specifications Table

| Subject area                        | Physical chemistry, Biology  |
|-------------------------------------|-----------------------------|
| More specific subject area          | Lipid phase behavior        |
| Type of data                        | Figures (DSC scans), graph  |
| How data was acquired               | Differential scanning calorimetry; high-sensitivity differential adiabatic scanning microcalorimeter DASM-4 (Biopribor, Pushchino, Russia) |

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**Value of the data**

- The present data provide for the first time thermodynamic information concerning the cubic phase formation in PE dispersions upon temperature cycling through their $L_\alpha$–$H_{II}$ transition.
- The data demonstrate that the $L_\alpha$–$H_{II}$ phase transition endotherm gradually decrease in enthalpy during the lamellar to cubic phase conversion upon $T$-cycling; the transition temperature exhibits specific, two-phase dependence on the cycle number.
- The cubic phases found to form in diluted DPoPE dispersions are of particular interest because of their facile formation and stability over prolonged periods of time at physiologically relevant conditions in a broad temperature range.

1. **Data**

It has been reported that phosphatidylethanolamine (PE) dispersions are able to form highly stable $I_{m3m}$ and $P_{n3m}$ cubic phases as a result of a temperature cycling through their $L_\alpha$–$H_{II}$ transition, as demonstrated by X-ray diffraction [1,2]. The data presented here include calorimetric scans recorded while applying temperature cycling on PE dispersion samples directly in the calorimetric cell (Figs. 1 and 2). Further, the thermodynamic parameters (temperature and enthalpy) of the recorded

![Fig. 1. Consecutive calorimetric scans of the $L_\alpha$ → $H_{II}$ transition in DPoPE / 1 M NaH$_2$PO$_4$ (5 mg/ml) dispersion recorded upon $T$-cycling 20–60 °C at 1 °C/min.](image-url)
endotherms were calculated and plotted as a function of the cycle number (Fig. 3). The L_{α}-H_{II} phase transition endotherm gradually decreases in enthalpy during the lamellar to cubic phase conversion upon T-cycling. The transition temperature exhibits specific, two-phase dependence on the cycle number.

2. Experimental design, materials and methods

1,2-dipalmitoleoyl-sn-glycero-3-phosphoethanolamine (DPOPE), 1,2-dielaidoyl-sn-glycero-3-phosphoethanolamine (DEPE), and 1-stearoyl-2-oleoyl-sn-glycero-3-phosphoethanolamine (SOPE) were from Avanti Polar Lipids Inc. (Alabaster, AL). All lipids were found to migrate as single spots in thin-layer chromatography checks. Microcalorimetric scans of their diluted dispersions showed highly cooperative phase transitions at temperatures in agreement with the published values.

Samples were prepared by dispersing weighed amount of lipid into required amount of the appropriate solution. Samples of DPOPE were homogenized by vortex-mixing 8–10 times for 1–2 min at room temperature, at which they are in a liquid-crystalline state. Samples of DEPE and SOPE, which are in gel phase at room temperature, were homogenized by cycling 8–10 times between 40 °C (above
their chain-melting transition) and ice bath and vortex-mixed at these temperatures for 1–2 min. Lipid concentrations were 5–25 mg/ml.

Microcalorimetric measurements were performed using a high-sensitivity differential adiabatic scanning microcalorimeter DASM-4 (Biopribor, Pushchino, Russia) with sensitivity better than $4 \times 10^{-6}$ cal K$^{-1}$ and a noise level less than $5 \times 10^{-7}$ W. Multiple heating–cooling cycles in temperature ranges similar to those used in the X-ray experiments were directly performed on samples in the calorimeter cell. Transition enthalpies and temperatures were determined in a standard way, as previously described [3].

![Fig. 3. Evolution of the thermodynamic parameters of the Lα–HII transition in PE dispersions during T-cycling as a function of the cycle number: (A) transition temperature $T$; (B) transition enthalpy $\Delta H$.](image-url)
Supplementary data associated with this article can be found in the online version at http://dx.doi.org/10.1016/j.dib.2018.03.056.

References

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