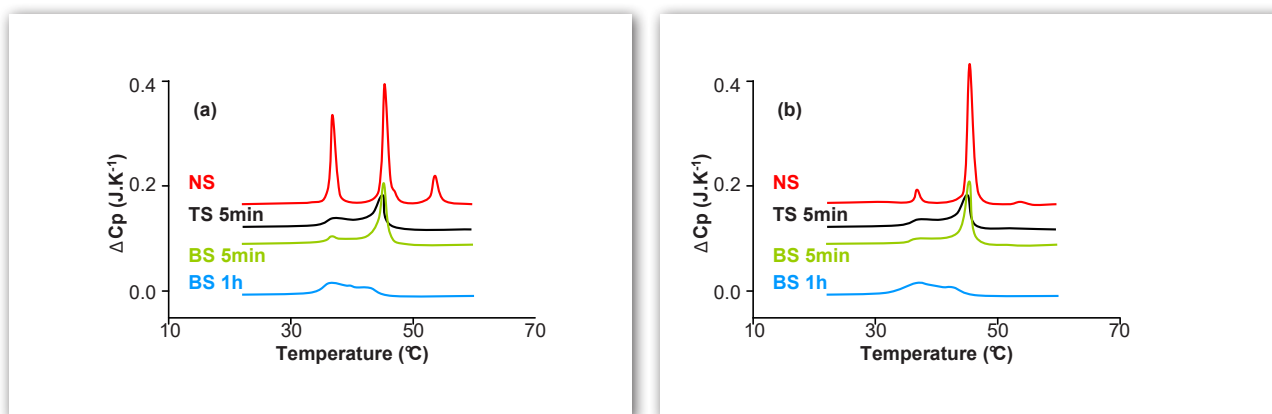


Effect of sonication time on the phase transition of DODAB vesicles

INTRODUCTION

Vesicle solutions formed by the cationic lipid dioctadecyldimethylammonium bromide (DODAB) have been extensively used in the past 20 years. Because of its widespread use, as membrane mimicking models and in topics such as inter alia gene therapy, drug solubilization, surface recognition in nanotemplates, kinetics of chemical reactions and catalysis, it is necessary to have consistent quantitative data on chain melting transition parameters and their dependence on preparation procedures. DSC technique is here used as a systematic method of investigation of the influence of sonication method.



DSC thermograms for 10mM DODAB vesicle solutions prepared with different sonication times (0, 5, 60 min). (a) first upscan and (b) second upscan. Legend: NS: non-sonicated; TS: tip-sonicated; BS: bath-sonicated. Time in minutes refers to the duration of the sonication treatment.

EXPERIMENT

To investigate the effects of sonication time, the sonicated samples were rigorously prepared in an identical way, except for the time exposed bath-sonication varied between 5 and 90 min. After preparation, 10mM DODAB vesicle solutions were manually agitated and left for cooling at room temperature during 30min before the first DSC run. Then, experiments were conducted on a MICROCALVET ULTRA at a scan rate of 0.5 K/min between room temperature and 60°C and both first and second scans were recorded. Two steel batch cells were used, one for the sample and the other containing water as reference.

RESULTS AND CONCLUSION

For both scans of the non-sonicated solution, well-defined transitions are observed at $T=36.5$, 45.3 and 53.6°C . Moreover, from the first to second scan, only the middle peak (the main transition temperature T_m) becomes slightly more pronounced in intensity, while the others decrease in magnitude. For all the sonicated solutions, we can note that the transitions are broader and T_m values decreases when sonication power or sonication time increases. Moreover, a similar thermogram profile is observed between the shortly sonicated samples (5min bath and tip-sonicated).

As can be seen from the obtained results, the effect of sonication is to break the large bilayer structures and produce smaller vesicles. Therefore, a population of relatively polydisperse small to medium sized vesicles can be produced.

INSTRUMENT

MICROCALVET ULTRA

-20 to 170°C



HIGHEST HEAT MEASUREMENT ACCURACY

Calvet 3D sensor based on Peltier elements with Joule effect calibration.

MODIFIABLE TEMPERATURE CONDITIONS

for increased flexibility and replication of real life conditions.

CONVENIENT INTERCHANGEABLE CRUCIBLES AND CELLS

to perform even the most demanding experiments using one instrument :

- high pressure (1000bar) and high vacuum
- pressure measurement and control
- mixing experiment

EXTERNAL COUPLING CAPABILITY

designed to increase your research options including manometry, BET instrumentation, gas analyzers, humidity controllers and gas panels

REFERENCE

Neat DODAB vesicles: Effect of sonication time on the phase transition thermodynamic parameters and its relation with incomplete chain freezing. R.O. Brito, E.F. Marques, Chemistry and Physics of Lipids 137 (2005) 18–28

For more details ask for publication B1738.