Junior Science Communications
Faculty of Applied Sciences, UiTM Shah Alam
https://journal.uitm.edu.my/ojs/index.php/JSC

E-ISSN 2637-0689
Vol. 33

Colloquium on Applied Sciences 2024
19-21 January 2024, Faculty of Applied Sciences, UiTM Shah Alam, Malaysia

Thermotropic Phase Behaviour of Glycolipids: A Review

Nur Suhaila Zulkifli[a], Hairul Amani Abdul Hamid[a*]

Structured Abstract

Background: Liquid crystal is known as mesophase that an intermediate state between conventional solids and isotropic liquids. Thermotropic liquid crystal (TLC) is one of the liquid crystals (LC) categorisation. In the thermotropic, the changes in temperature were produced in liquid crystal mesophase. Once the temperature increase, it will increase the energy and therefore the movement of the constituent molecule will stimulate phase changes. Glycolipid behaves as an amphiphilic molecule that possesses a polar carbohydrate head group a hydrophobic alkyl chain and is able to demonstrate liquid crystal phase behaviour.

Chain Length Affect Phase Behaviour: Chain length is the one factor that affects the phase behaviour of liquid crystals. The phase transition temperature increases with the increasing alkyl chain length. This is anticipated in increasing the chain length as more energy is required to break interaction to form the isotropic phase. This happened due to the higher van der Waals interaction between the hydrophobic tails with an increase in the alkyl chain length.

Technique in Determining Phase Characterisation: Differential Scanning Calorimetry (DSC) and Small-Angle X-ray Scattering (SAXS) are the two techniques that are utilised in the determination of phase characterisation. The method of using calorimetry is the most appropriate for the detection of the main lipid phase transition from crystalline to liquid crystalline state. DSC is primarily used to determine the energetics of phase transition and conformational changes and allows quantification of their temperature dependence. DSC is high sensitivity technique to reveal the presence of the liquid crystal phase. SAXS is a powerful technique in the determination of the thermotropic liquid crystalline structure. It is a probe-free and non-invasive technique with simple sample preparation and reasonable measurement time.

Conclusion: In conclusion, the formation of the phase behaviours of the glycolipid depends on the temperature produced. The greater the chain length, the greater the temperature produces to break the interaction of hydrogen bonds between the molecules.

Keywords: Liquid crystals, thermotropic, phase behaviour, glycolipids

*Correspondence: h.amani@uitm.edu.my

[a] School of Chemistry & Environment, Faculty of Applied Sciences, Universiti Teknologi MARA, Shah Alam, Malaysia