



Solid-liquid phase equilibrium:  
in search of suitable PCMs for low  
temperature energy storage

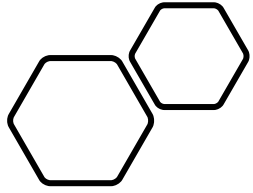
IATP Meeting 2022

Maria C. M. Sequeira, Fernando J. P. Caetano, Hermínio A. P. Diogo, João M. N. A. Fareleira

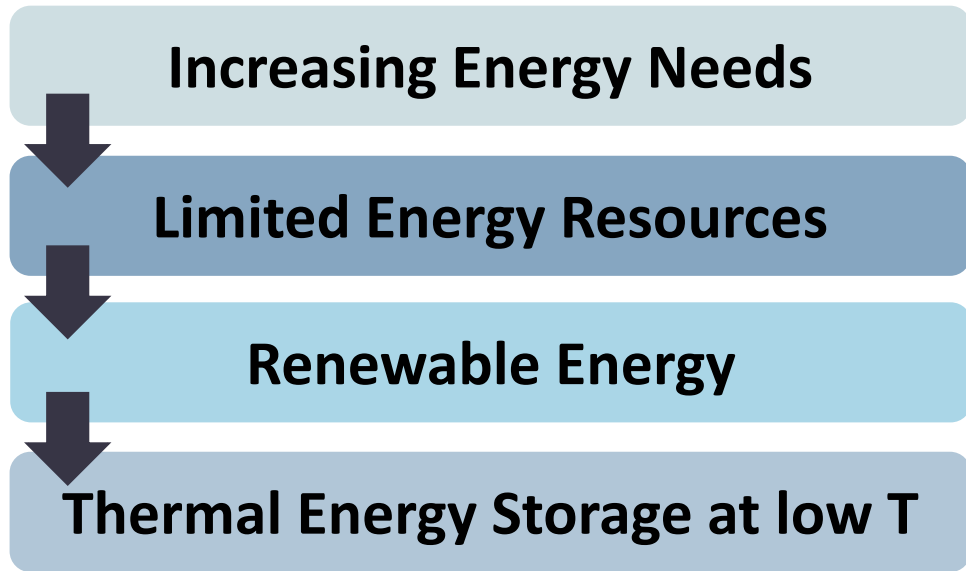
# Index

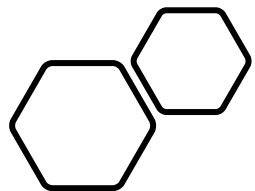
- 1. Background and Purpose**
- 2. Experimental Work**
  - Validation of the method
  - New results
  - Conclusions
- 3. Future Work**



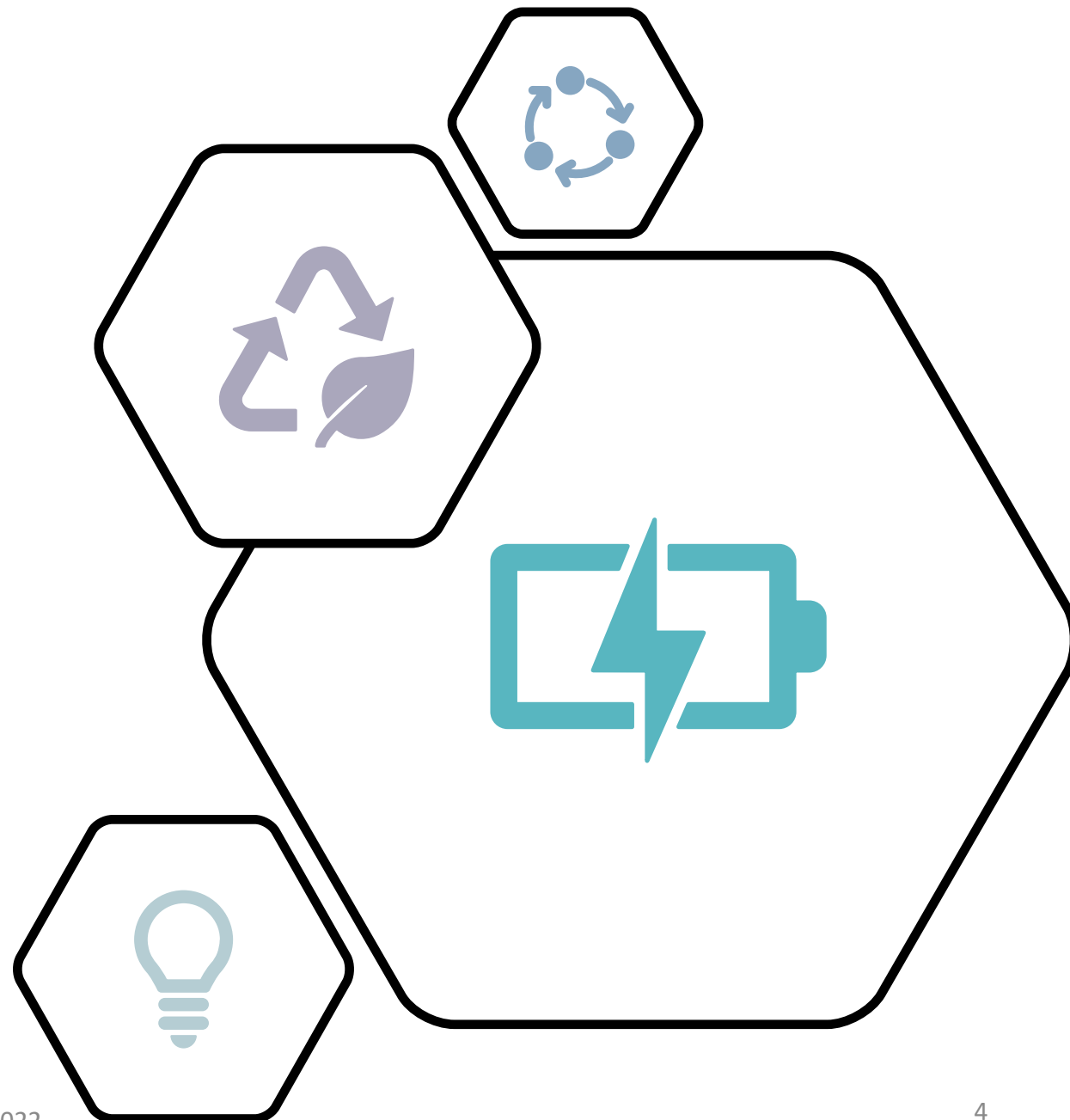
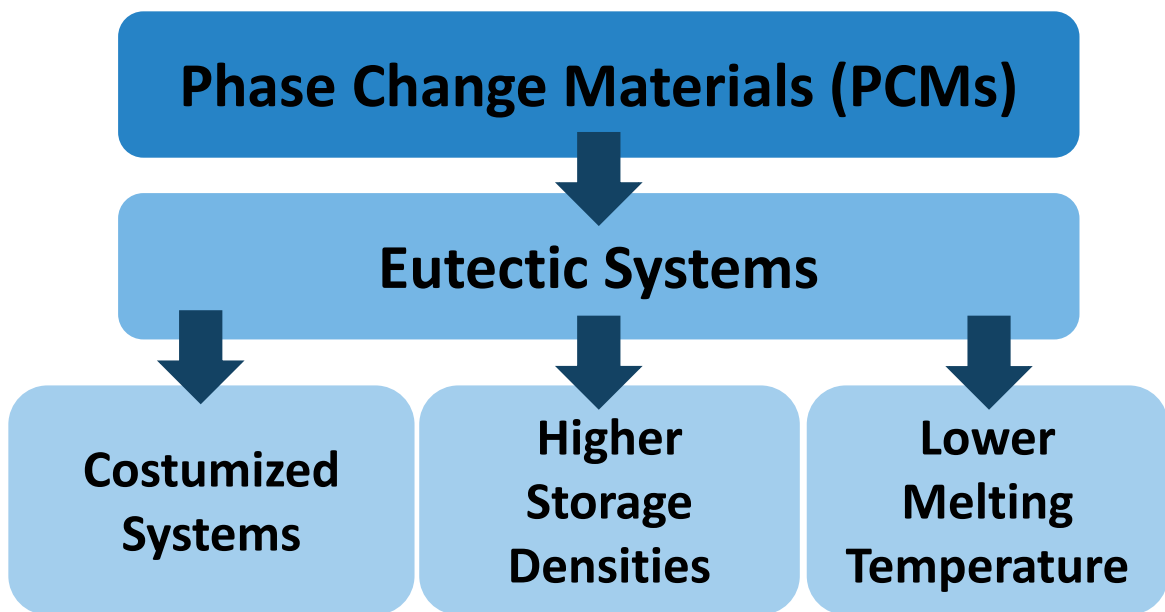


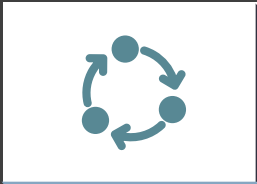
# 1. Background and Purpose

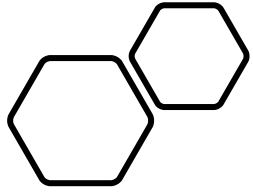




# 1. Background and Purpose





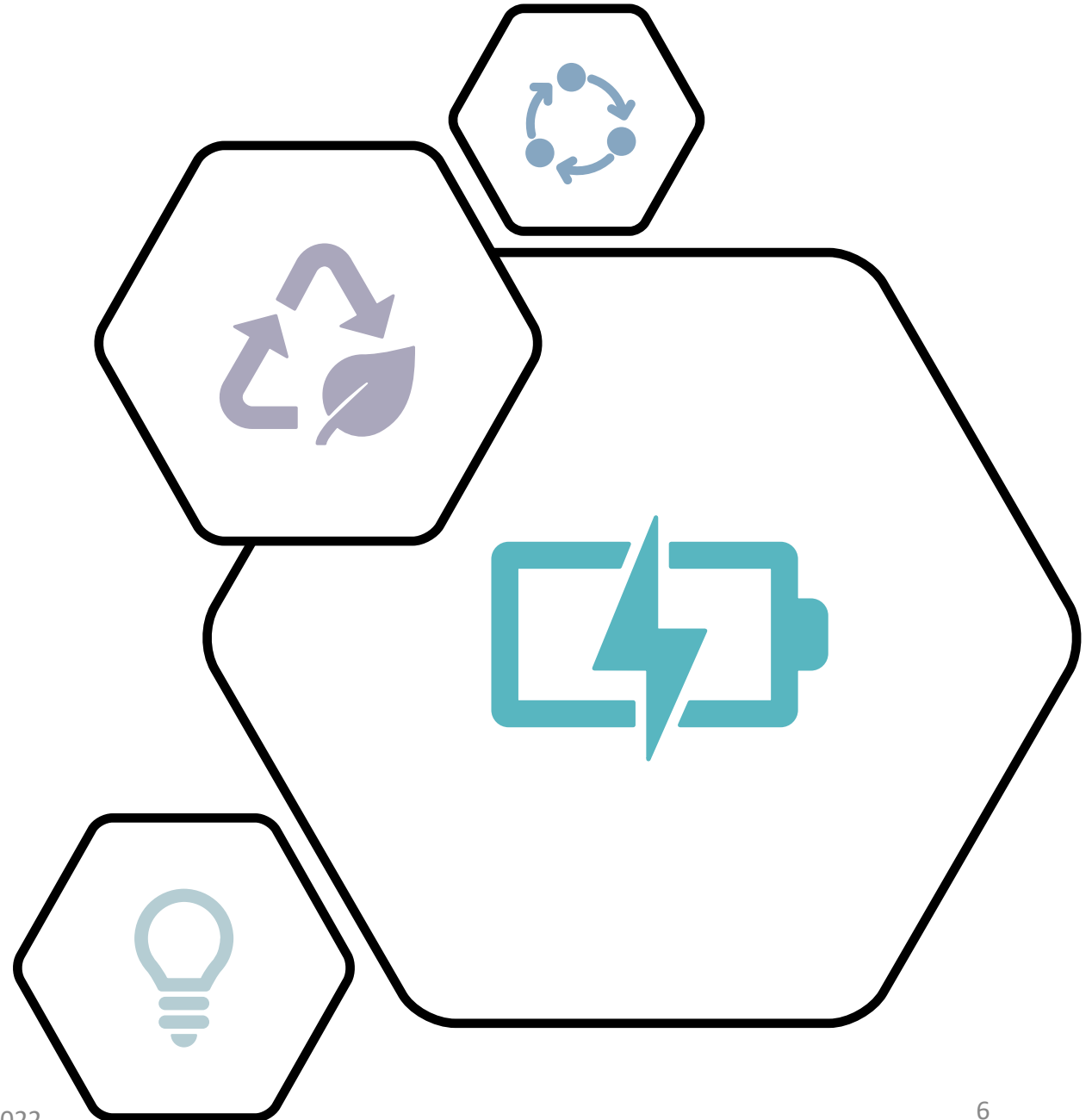


# 1. Background and Purpose

**Investigate new PCMs**

**New Experimental Data**

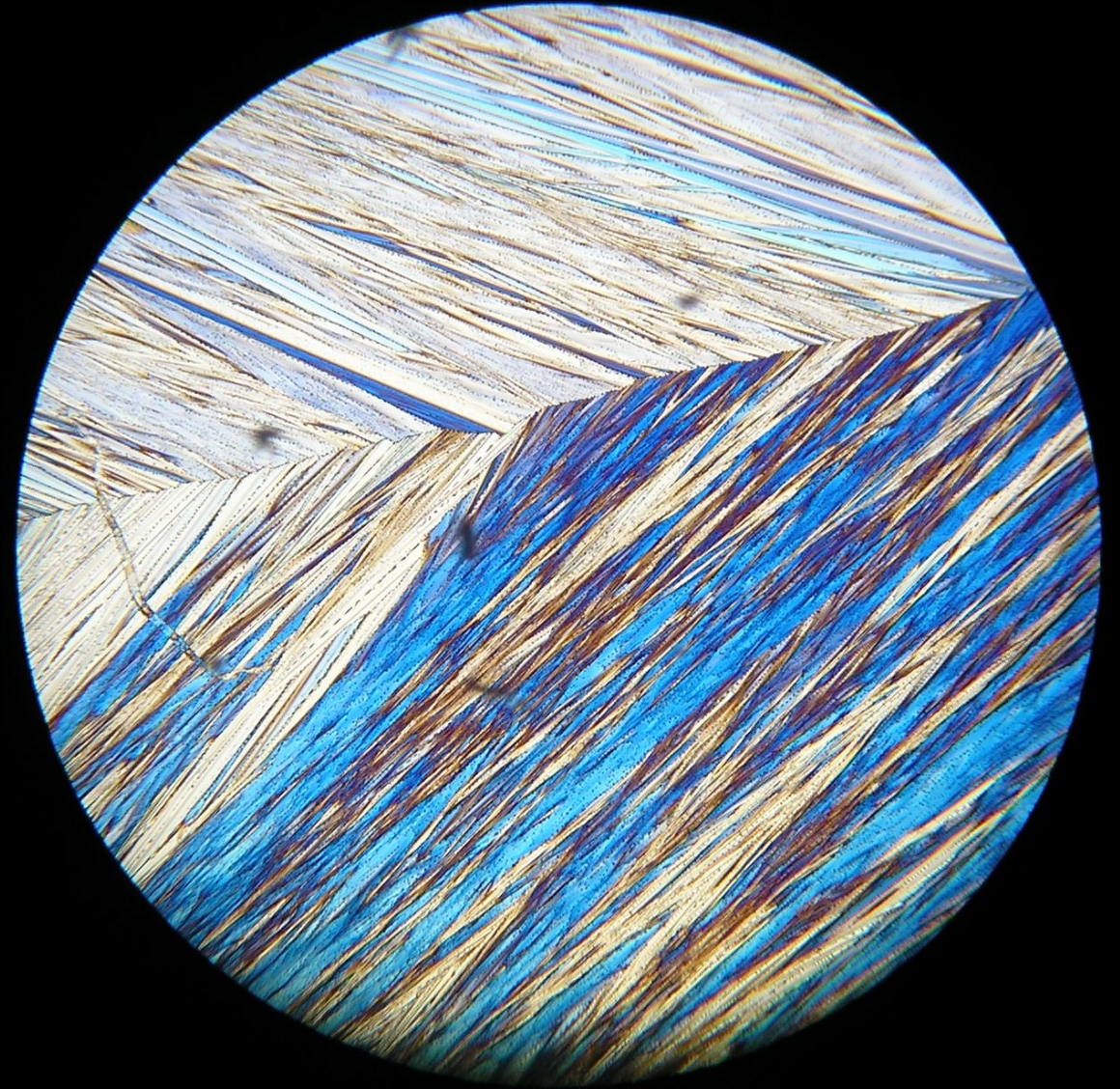
**Design and Assembly of New Equipments**





# 3. Experimental Work

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# Validation of the Method – Binary system of n-alkanes

Eutectic System: C<sub>10</sub> + C<sub>12</sub>

Literature

≈ 78%mol C<sub>10</sub>

T<sub>eut</sub> ≈ -35°C

Ventolà et al. 2002; DOI:  
[10.1007/s10019-002-0213-3](https://doi.org/10.1007/s10019-002-0213-3).

Experimental

80%mol C<sub>10</sub>

T<sub>eut</sub> ≈ -34.8°C

Validation OK

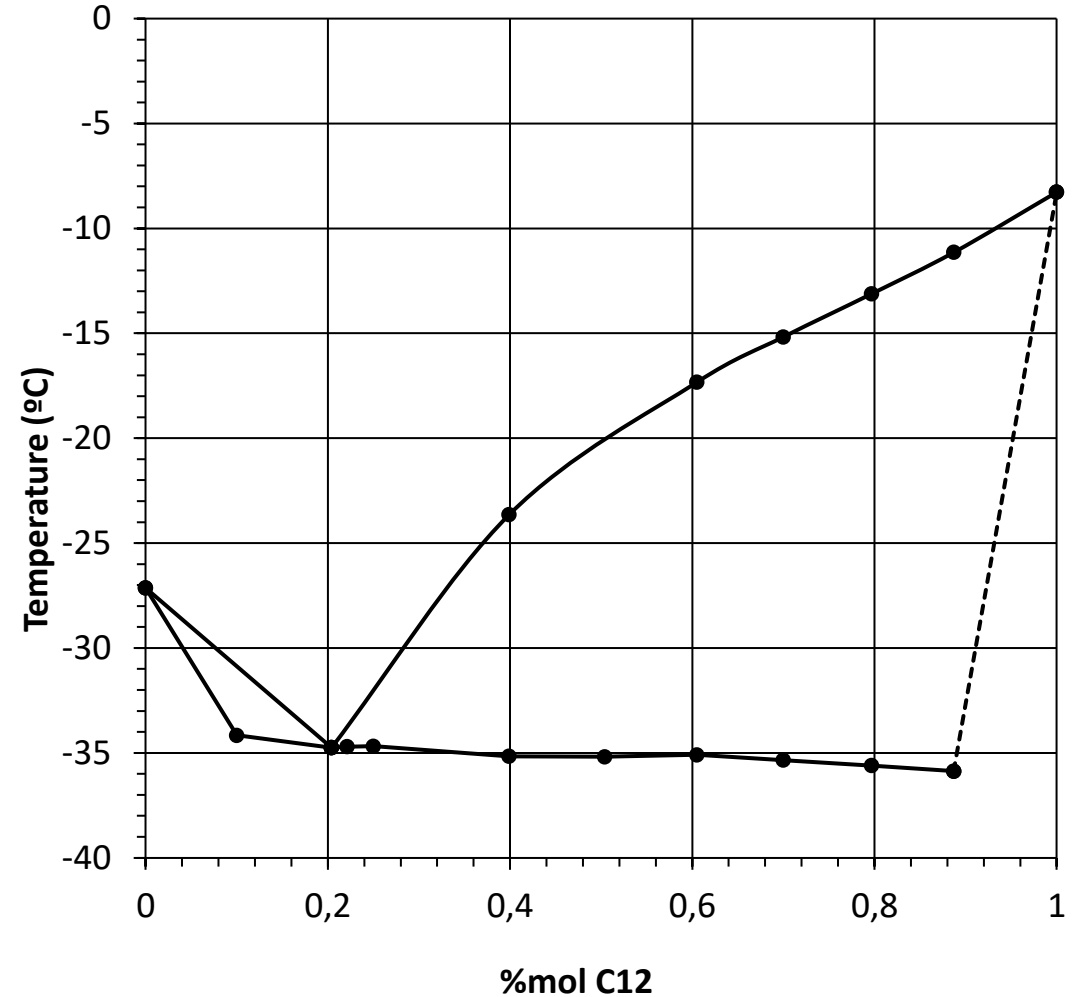
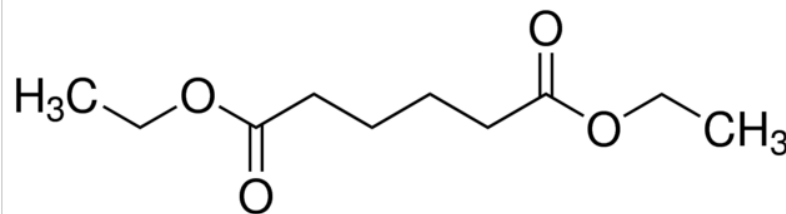


Figure 1 – Experimental C<sub>10</sub>-C<sub>12</sub> binary phase diagram.

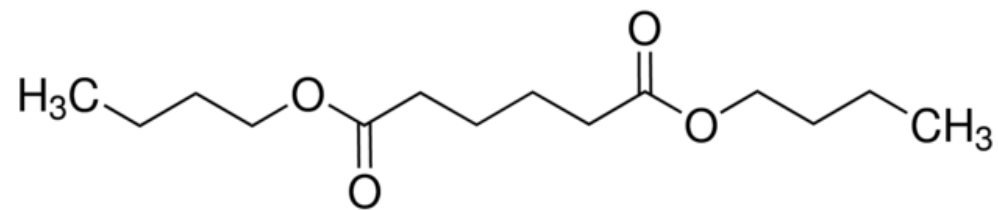


# New Experimental Results

## Binary System of di-n-alkyl adipates



Diethyl Adipate



Dibutyl Adipate

# New Experimental Results

## Binary System of di-n-alkyl adipates

Eutectic System

Eutectic Point:  
50% – 60% Diethyl  
 $\approx -33\text{ }^{\circ}\text{C}$

Polymorphism

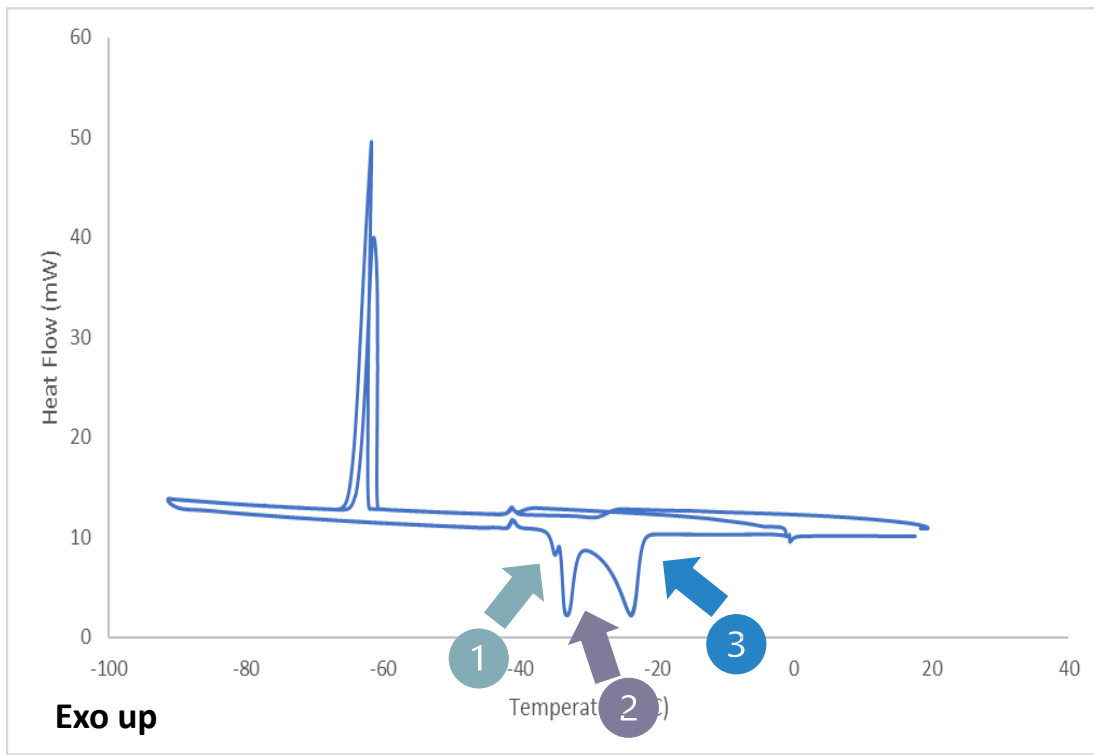


Figure 3 – Experimental results obtained by DSC for 10%mol in Dibutyl adipate.

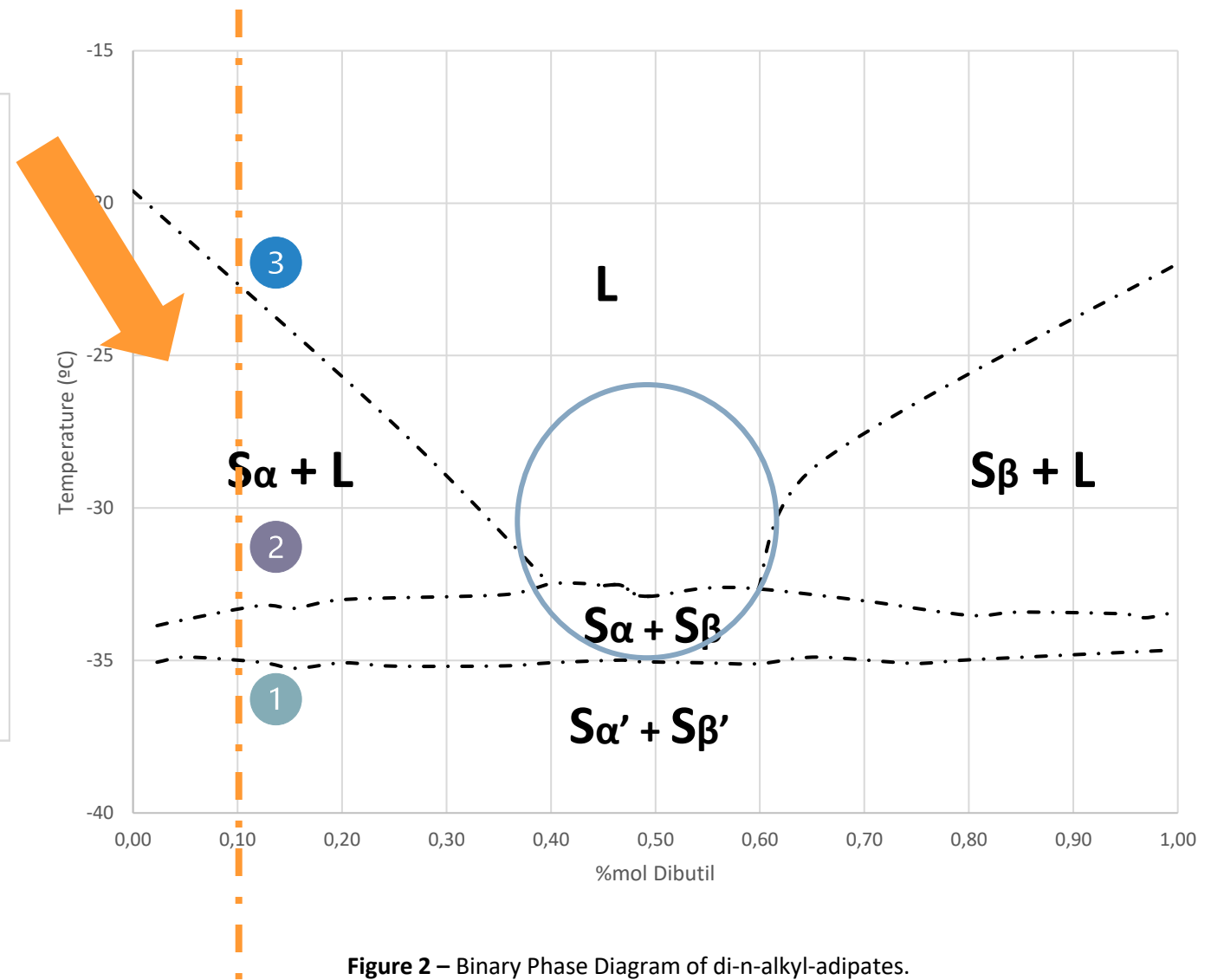


Figure 2 – Binary Phase Diagram of di-n-alkyl-adipates.

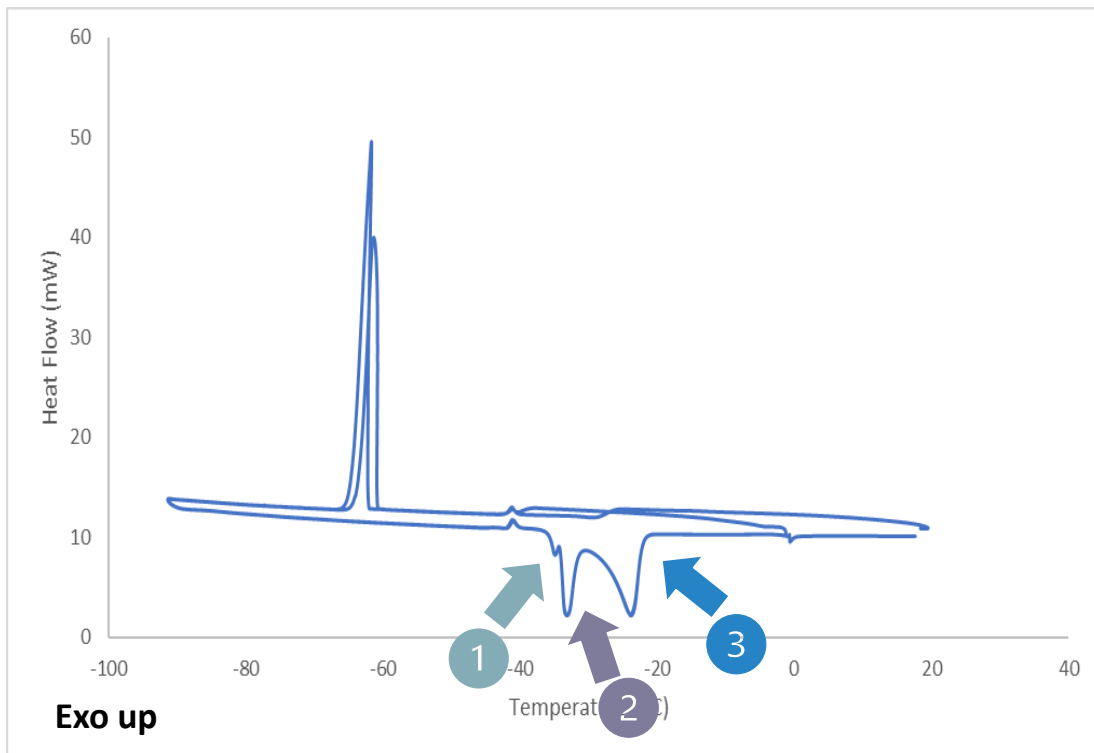


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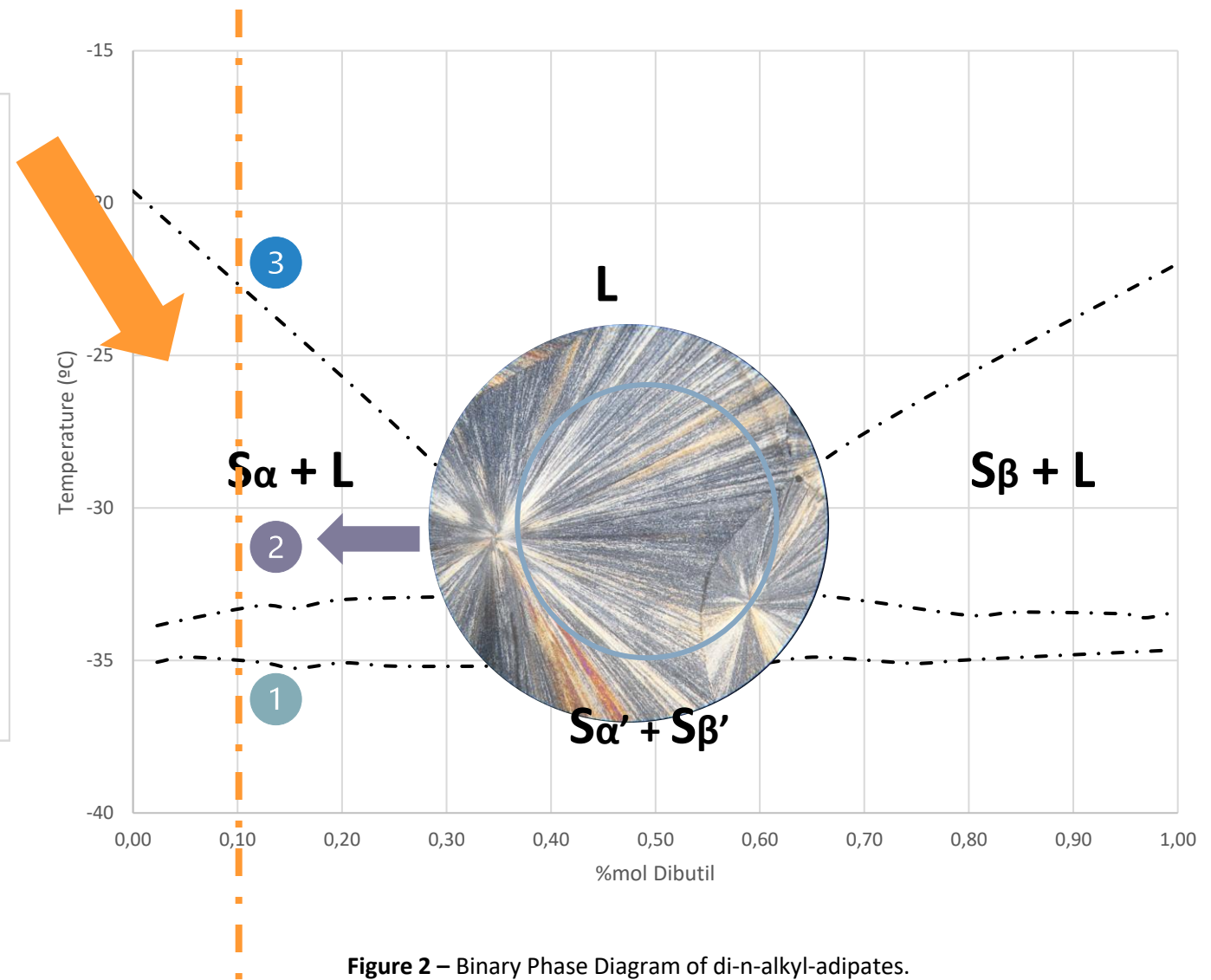


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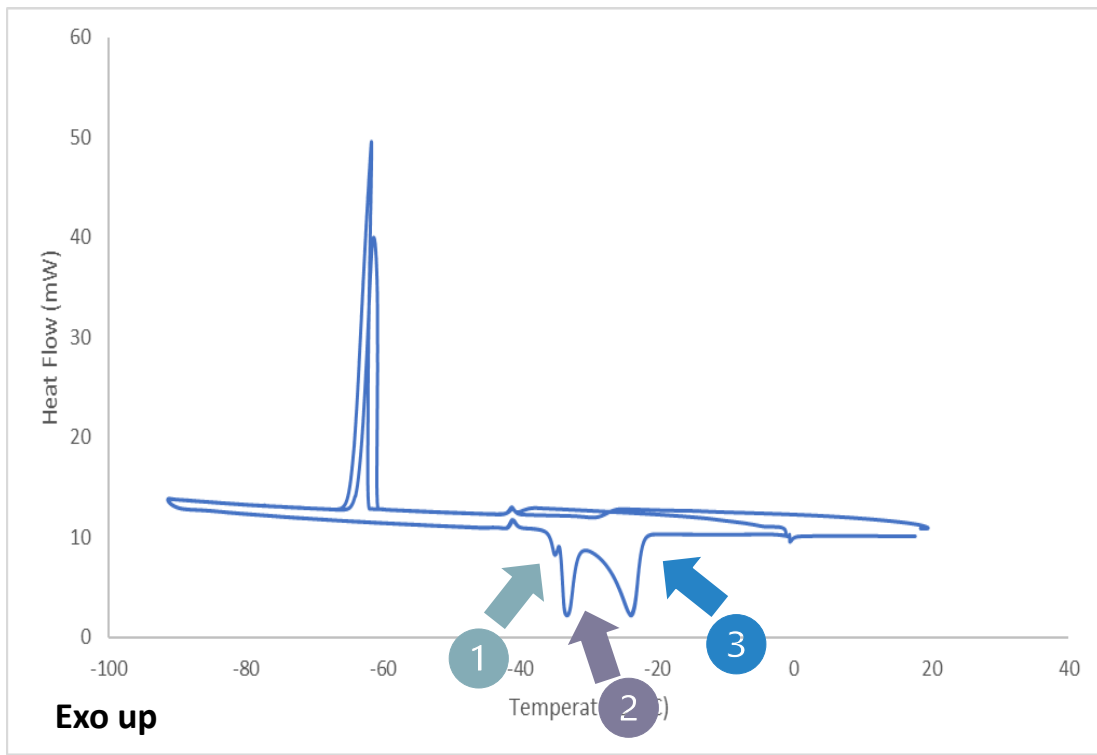
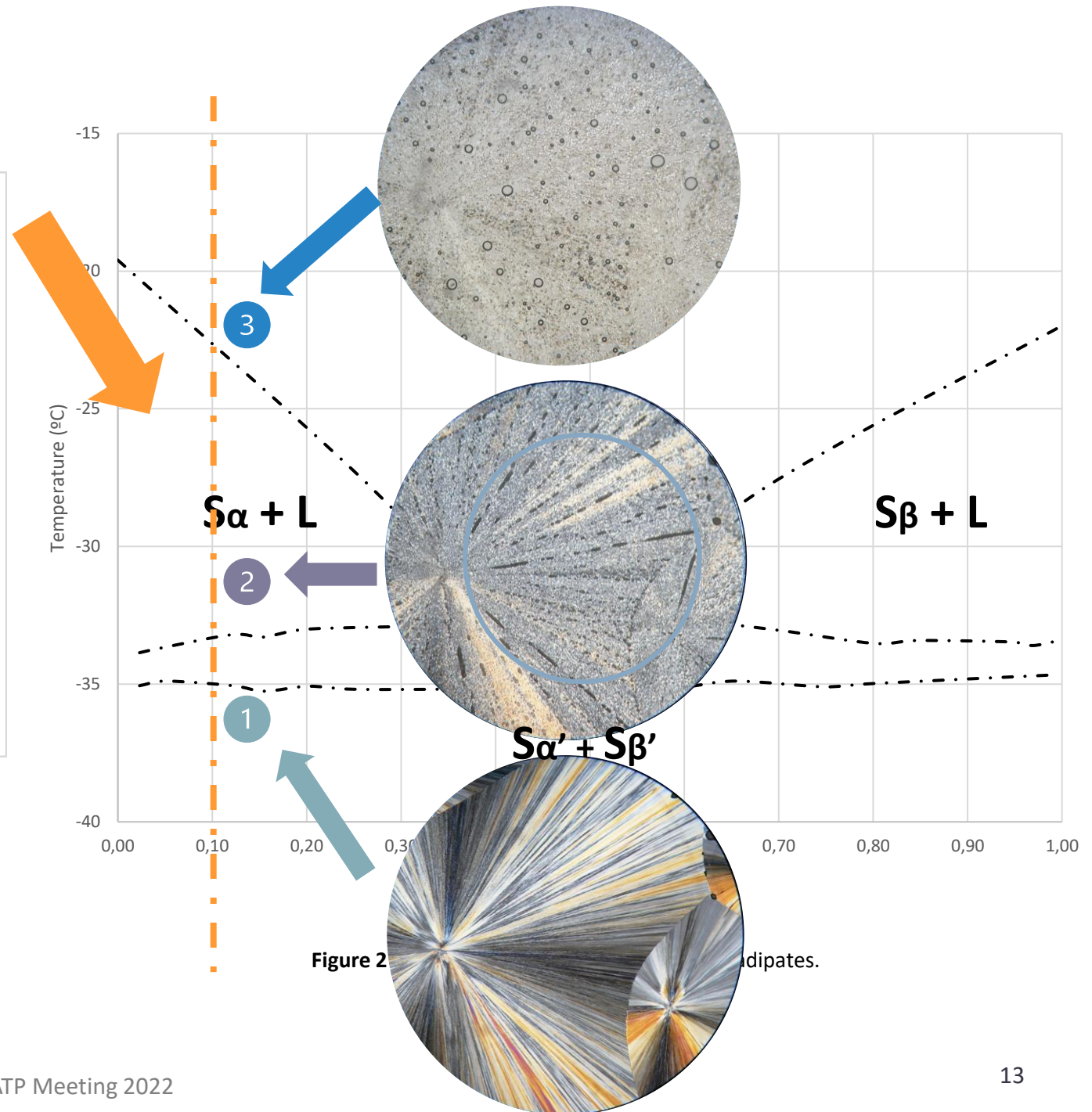


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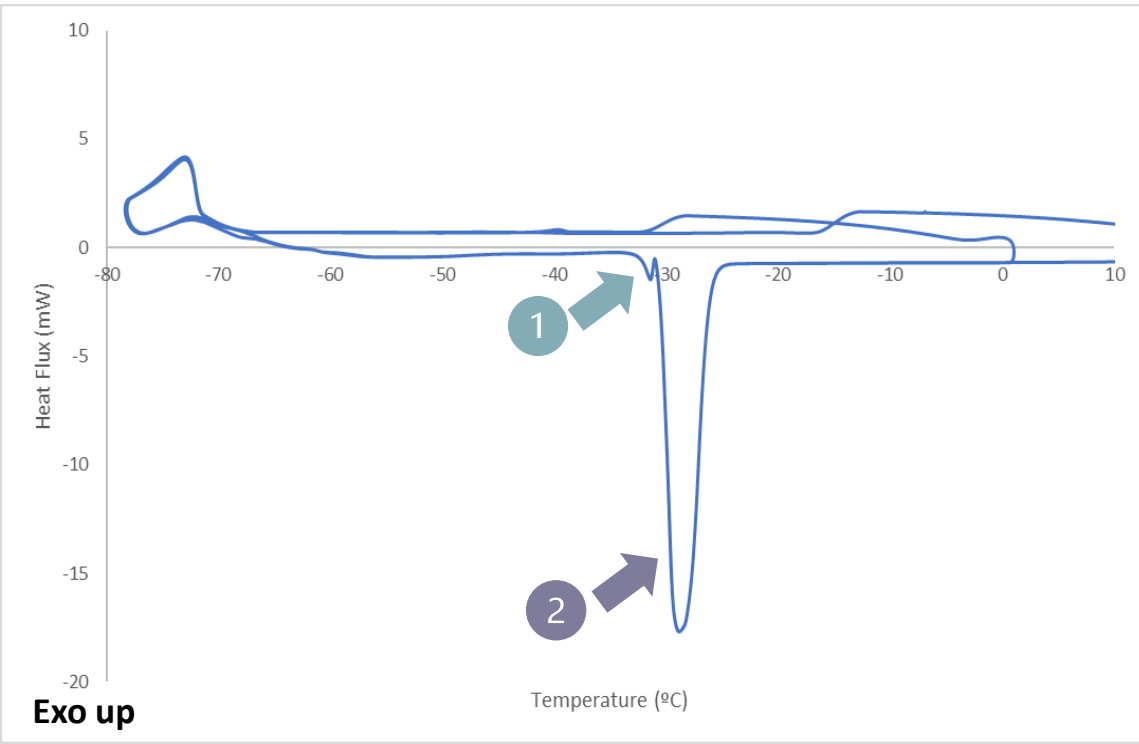


Figure 4 – Experimental results obtained by DSC for 50%mol in Diethyl adipate.

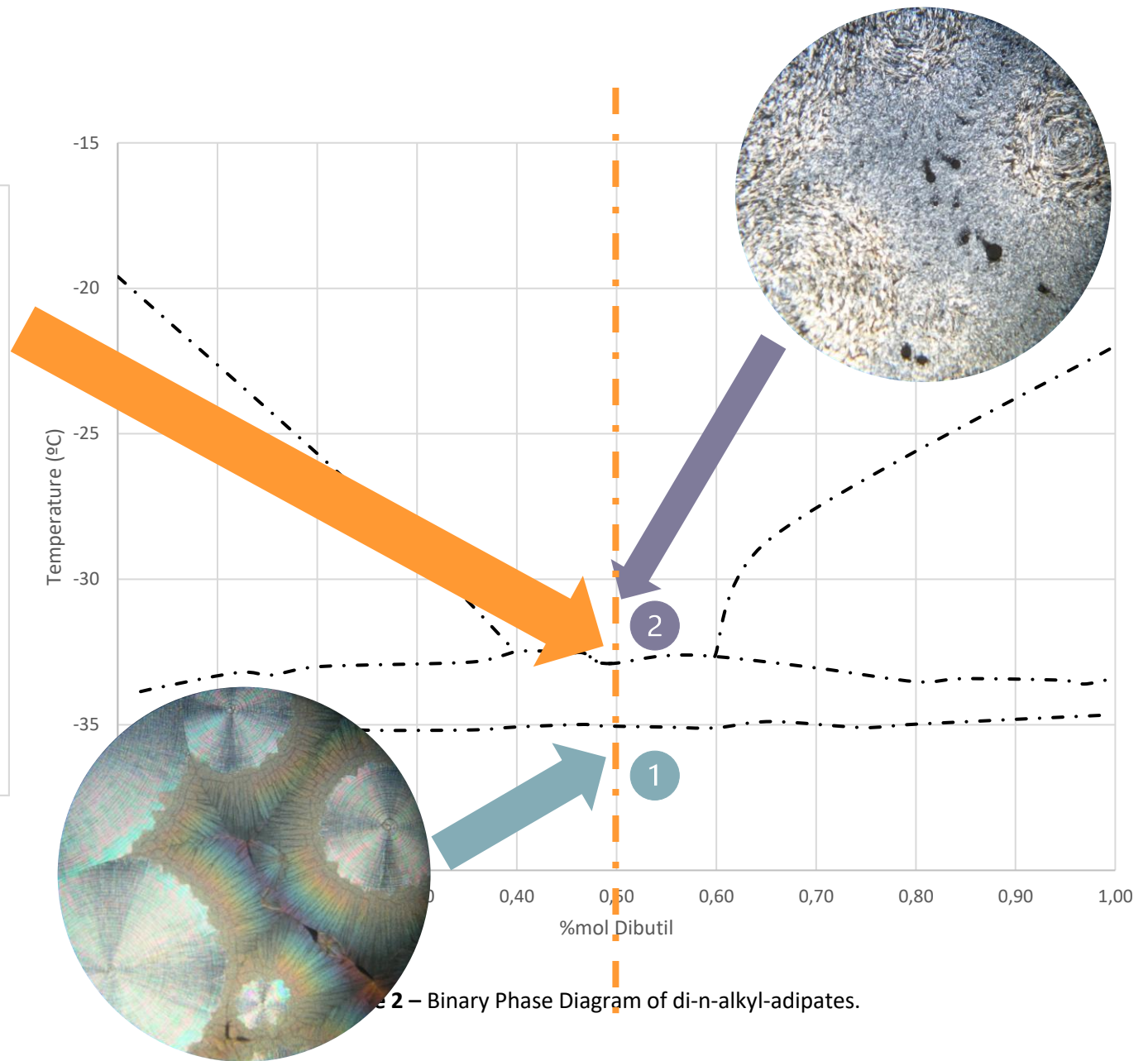


Figure 2 – Binary Phase Diagram of di-n-alkyl-adipates.



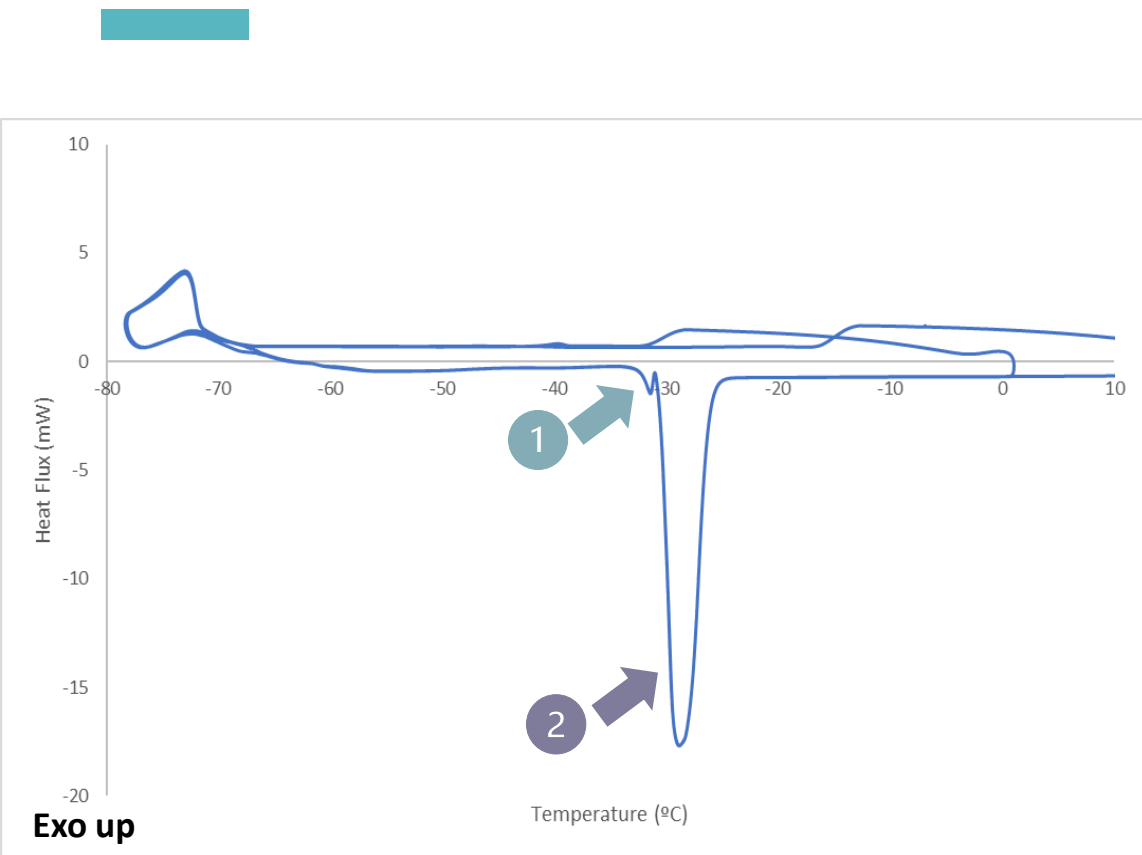


Figure 4 – Experimental results obtained by DSC for 50%mol in Diethyl adipate.

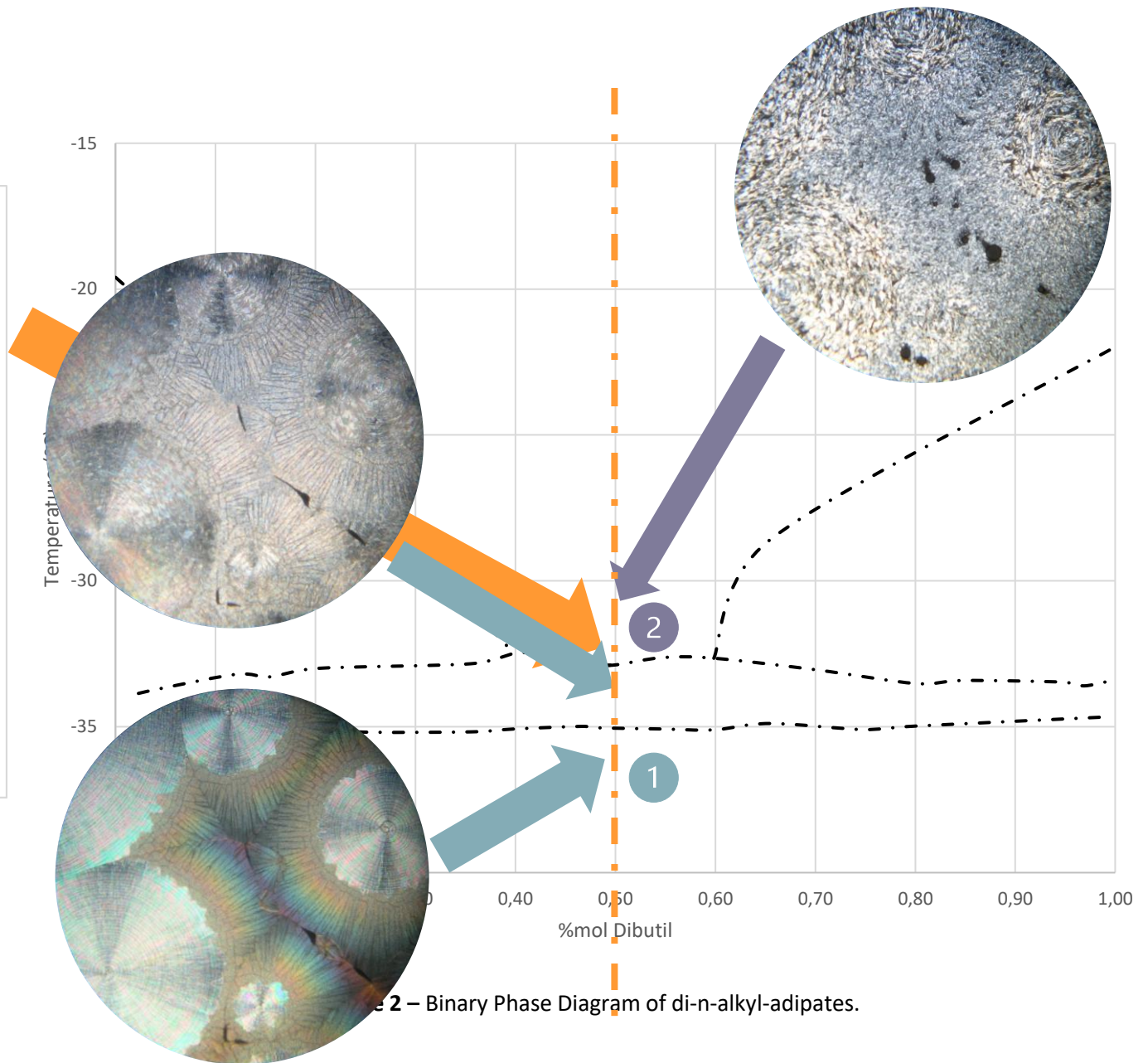


Figure 2 – Binary Phase Diagram of di-n-alkyl-adipates.

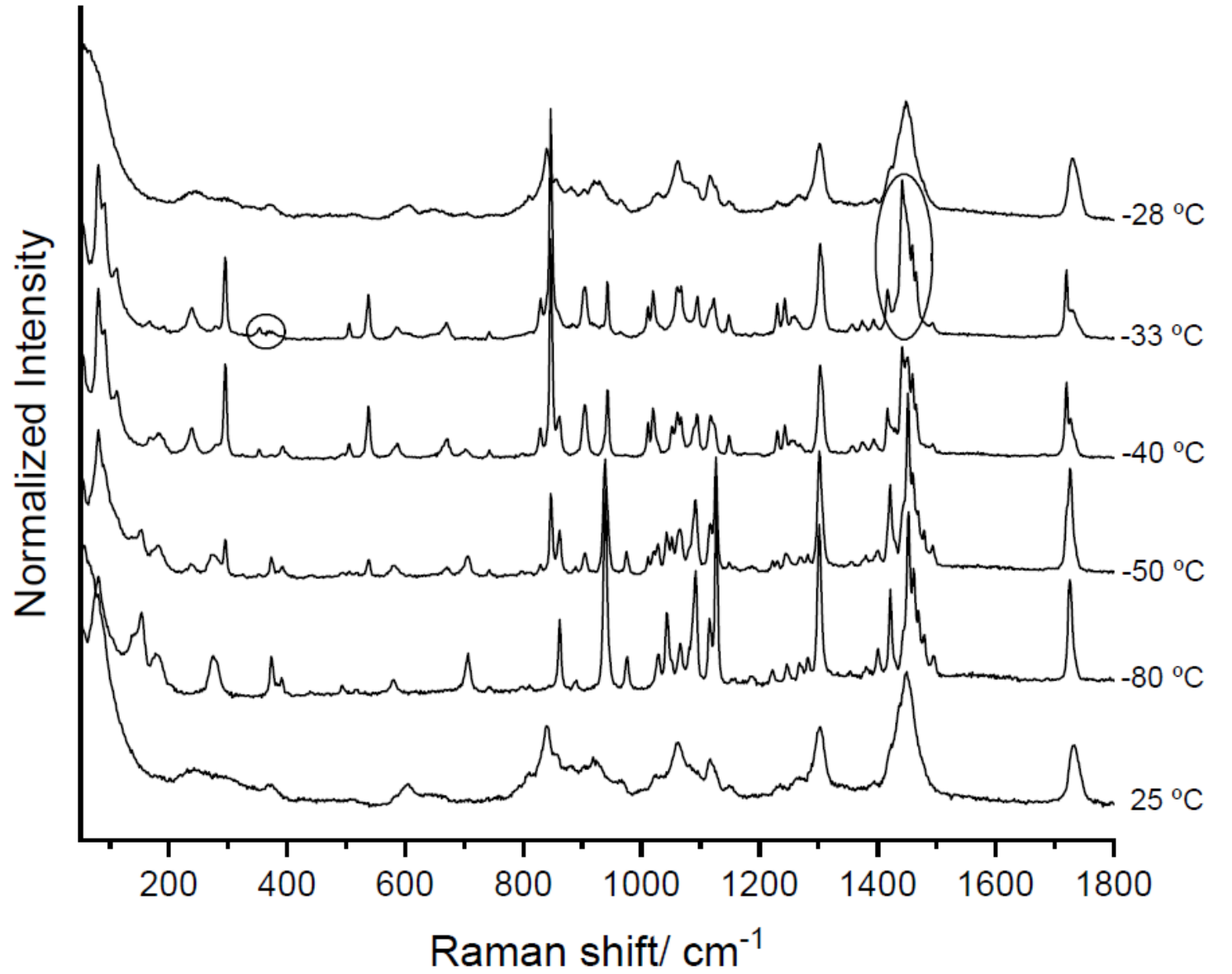
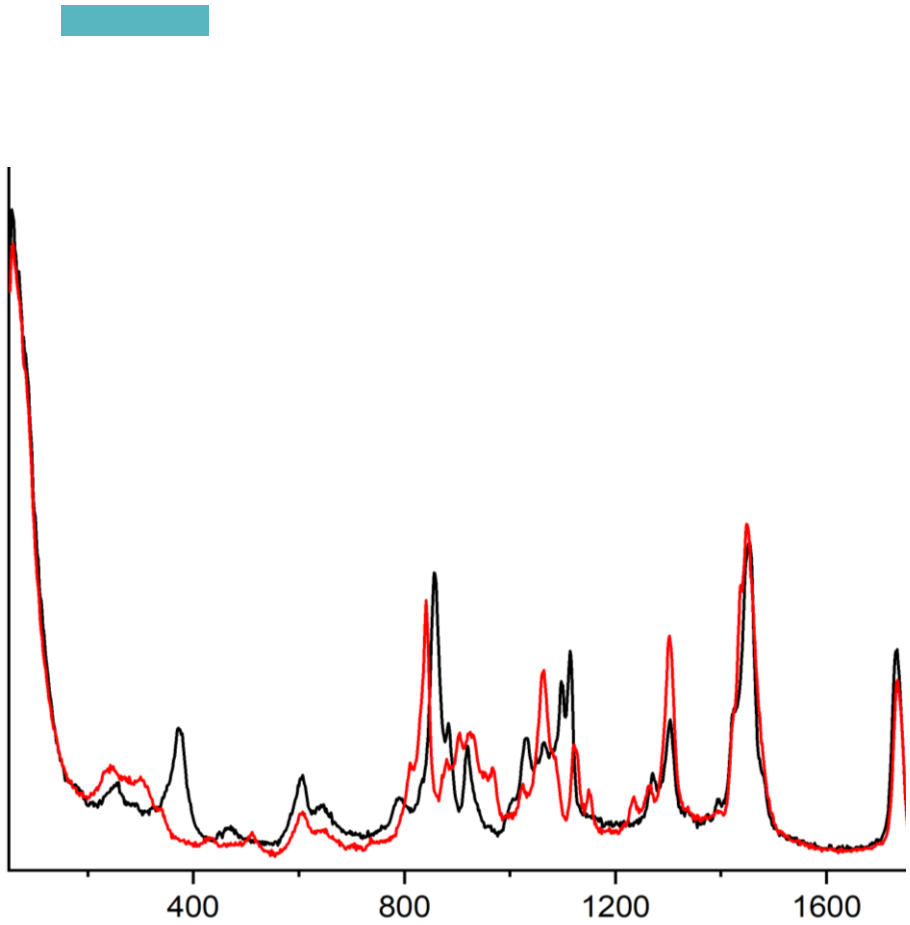


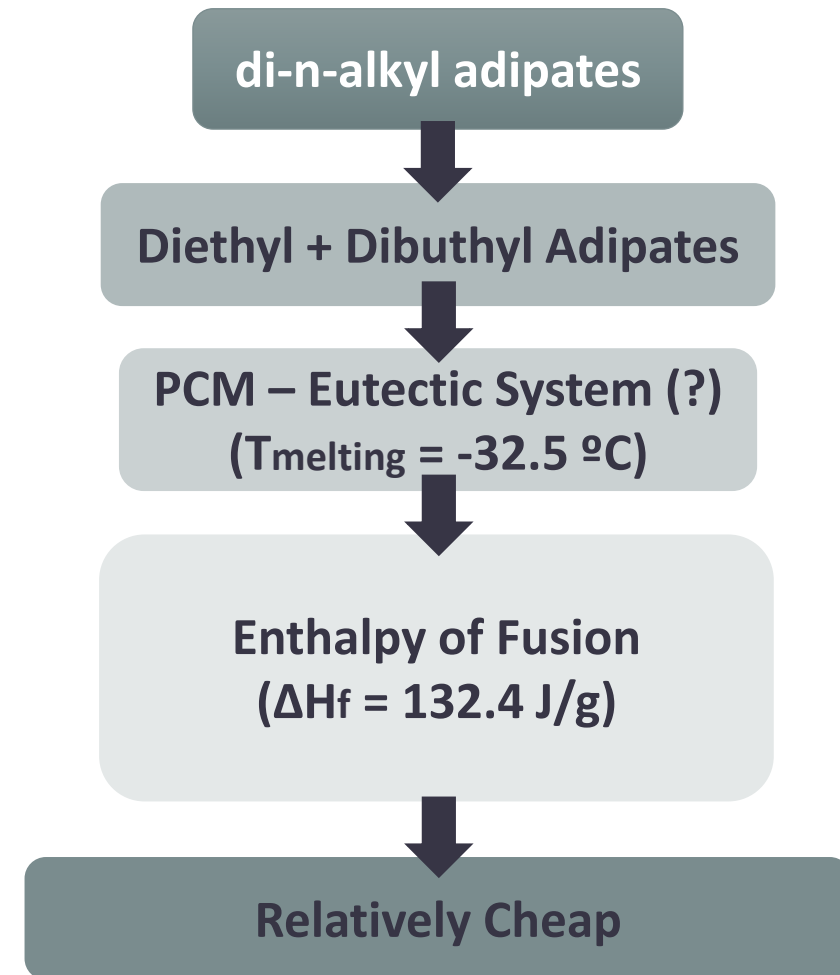
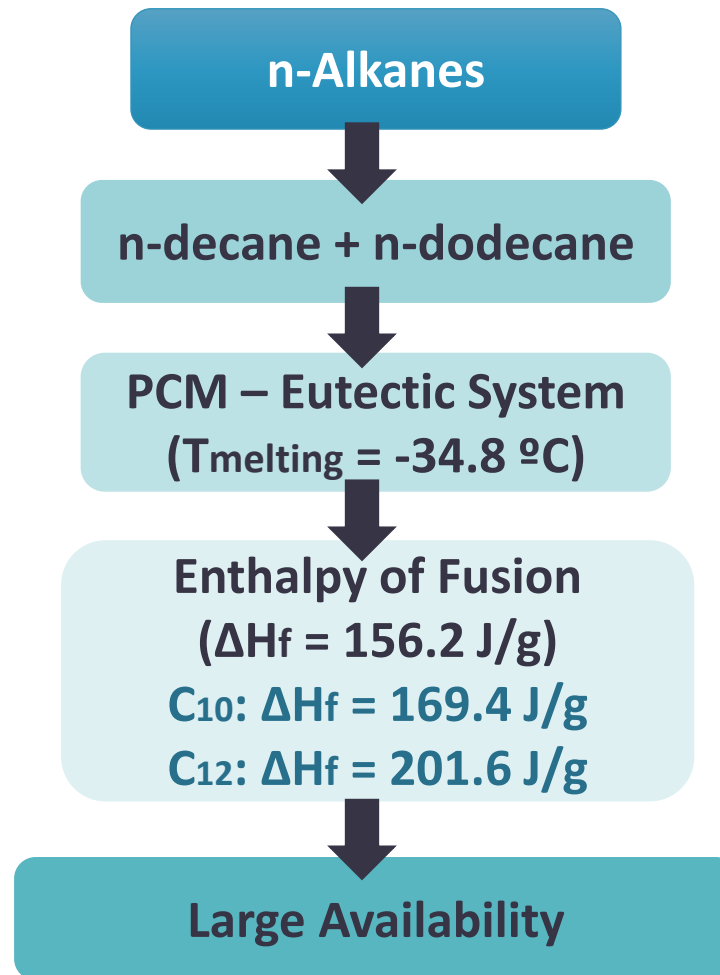
Figure 7 Figure 8 Raman spectra of a 65% bulk of DiIpye and DiIpye at different temperatures.

# Conclusions



**IATP Project: *Thermal Conductivity and Enthalpy of Fusion of n-alkanes as practical PCM***

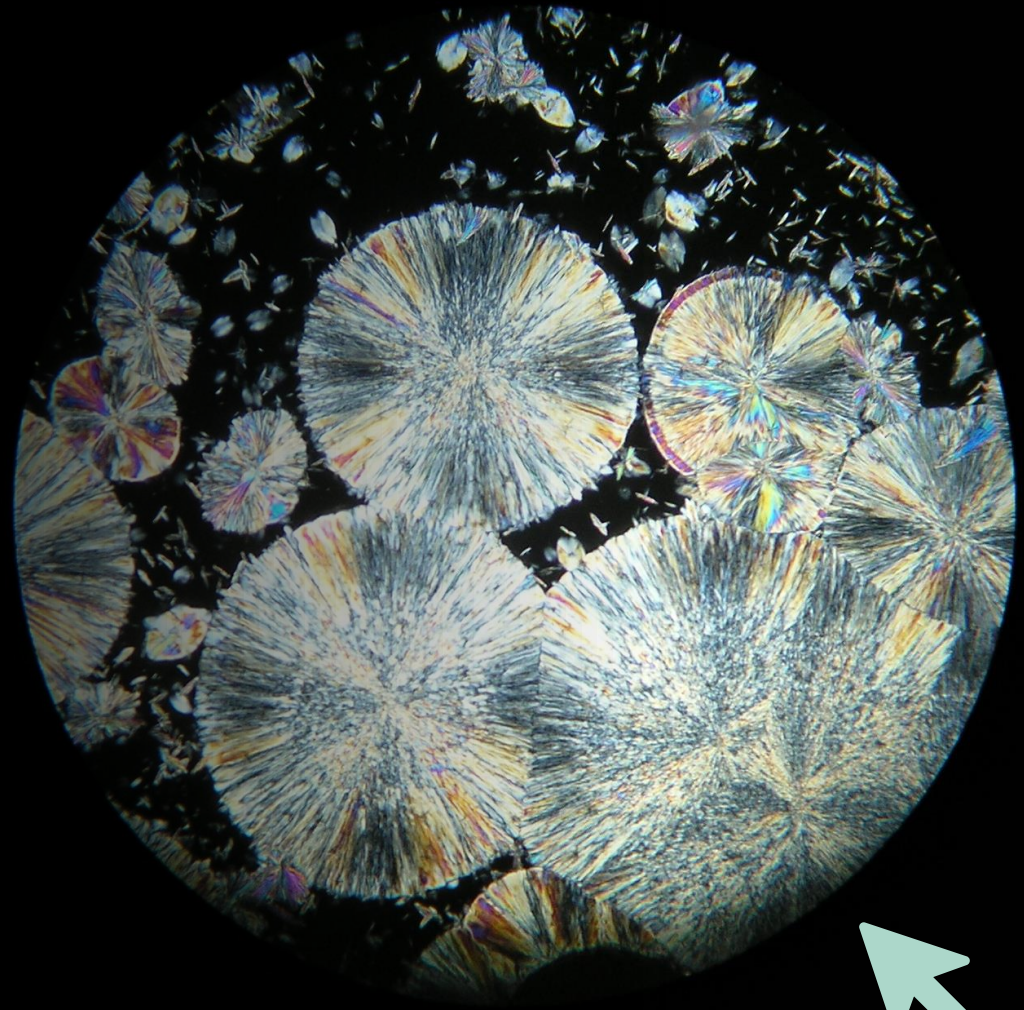
**GREAT POTENTIAL FOR THERMAL ENERGY STORAGE**





# 4. Future Work

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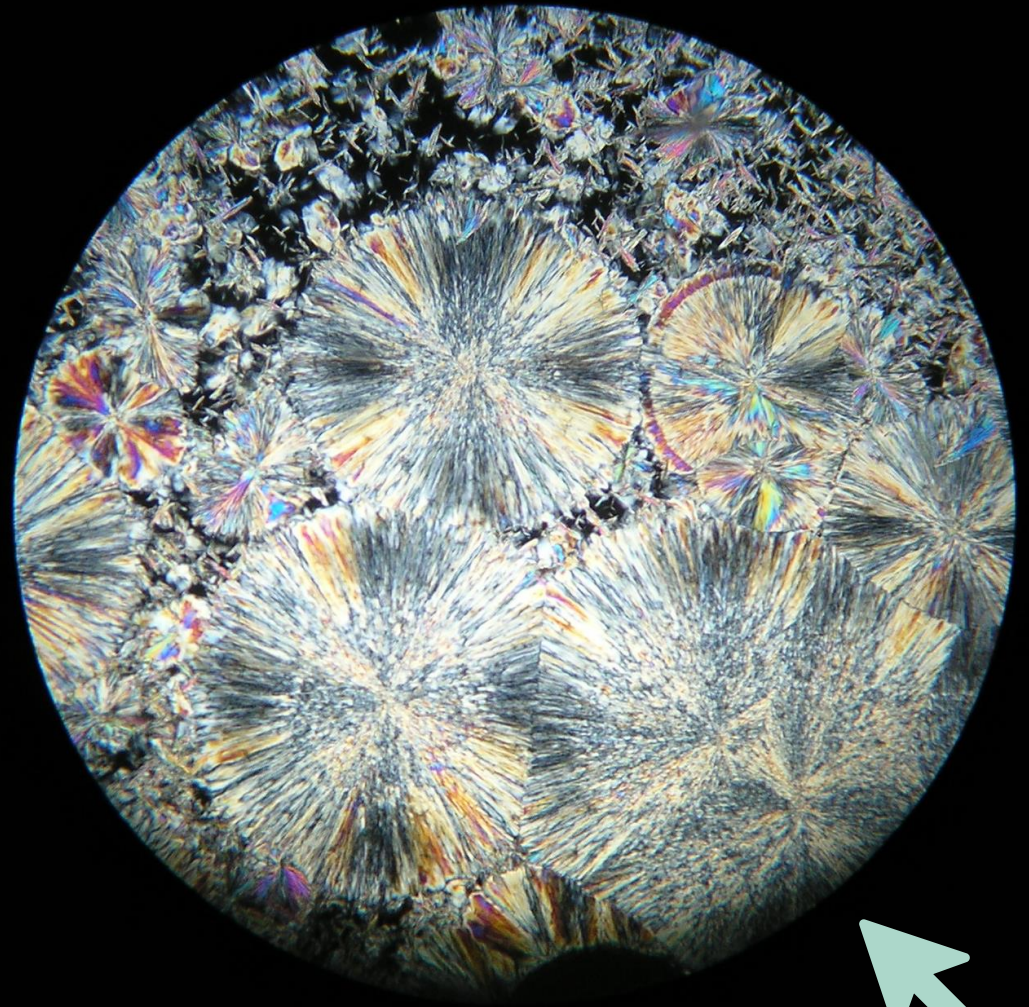
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# 4. Future Work

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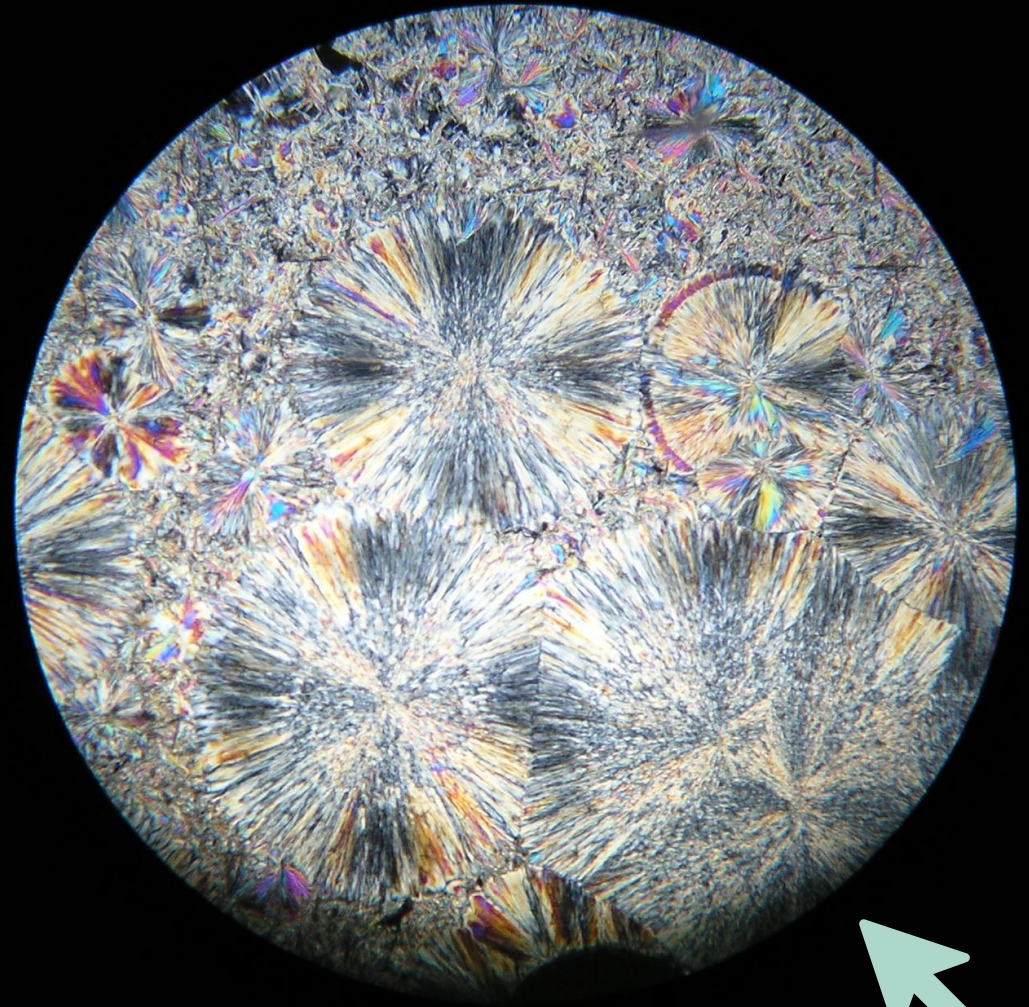


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# 4. Future Work

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MINISTÉRIO DA CIÊNCIA, TECNOLOGIA E ENSINO SUPERIOR



## Aknowledgements

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