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Abstract

Crystalline-crystalline diblock copolymers have unique hierarchical crystallization assemblies based on the interplay of phase separation and crystal nucleation and growth.^[1,2] Poly(ethylene oxide)-b-poly(ϵ -caprolactone) provides a unique opportunity to study a system where the transition temperatures of the two blocks are similar.^[3,4] For sequential crystallization, isothermal crystallization of the majority block (T_i) was analyzed to determine its effect on the percent crystallinity (χ) and the crystallization temperature of the minority block (T_x). From DSC analysis, it was discovered that the T_x increases with increasing T_i for a number of weight ratios. This phenomenon thereby demonstrated that the diluent effect seems to be the dominant factor compared to the confinement effect when the thicker majority block crystals are formed. Furthermore, it was found that there was a general increase in the minority block's χ which further supports the idea that the diluent effect is the primary driver for the minority block's crystallization behavior.

Experimental Approach

Powdered PEO-b-PCL samples of varying PEO weight fractions were purchased from Polymer Source Inc. and Advanced Polymer Materials Inc. All samples were used as received. Differential scanning calorimetry (DSC) was performed using a PerkinElmer DSC 8000 with an Intracooler II attachment. Approximately 5 mg of sample was carefully added to an aluminum DSC pan. The difference in mass between the sample and reference pans was ± 0.1 mg. Samples were heated to 80°C and held for 3 minutes. Then, they were cooled to the intended isothermal crystallization temperature at 40°C/min. The sample was held at that temperature until crystallization was complete. Subsequently, the sample was cooled to -20°C at a cooling rate of 20°C/min. The sample was held for 1 minute before it was reheated to 80°C at a rate of 40°C/min.



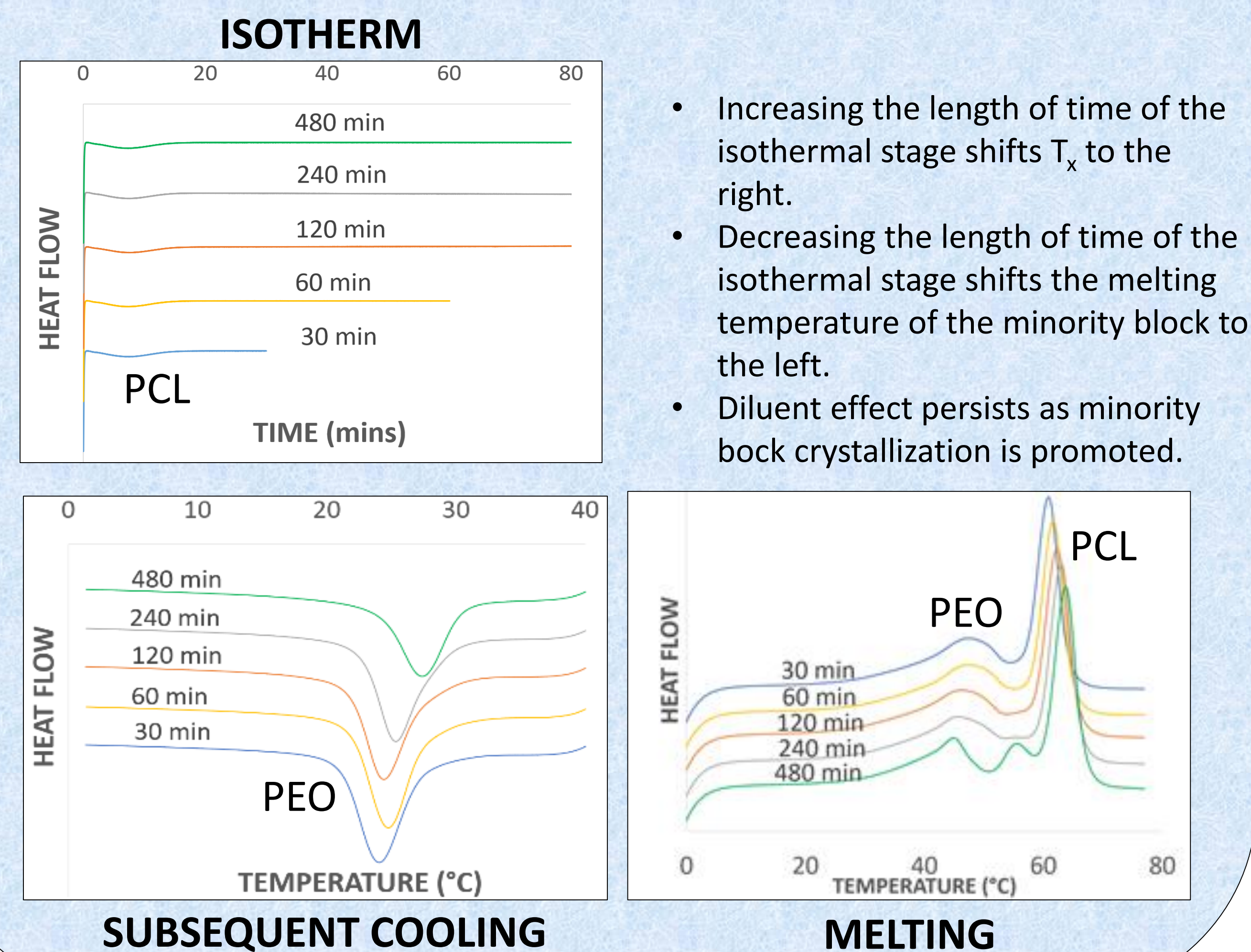
Acknowledgements

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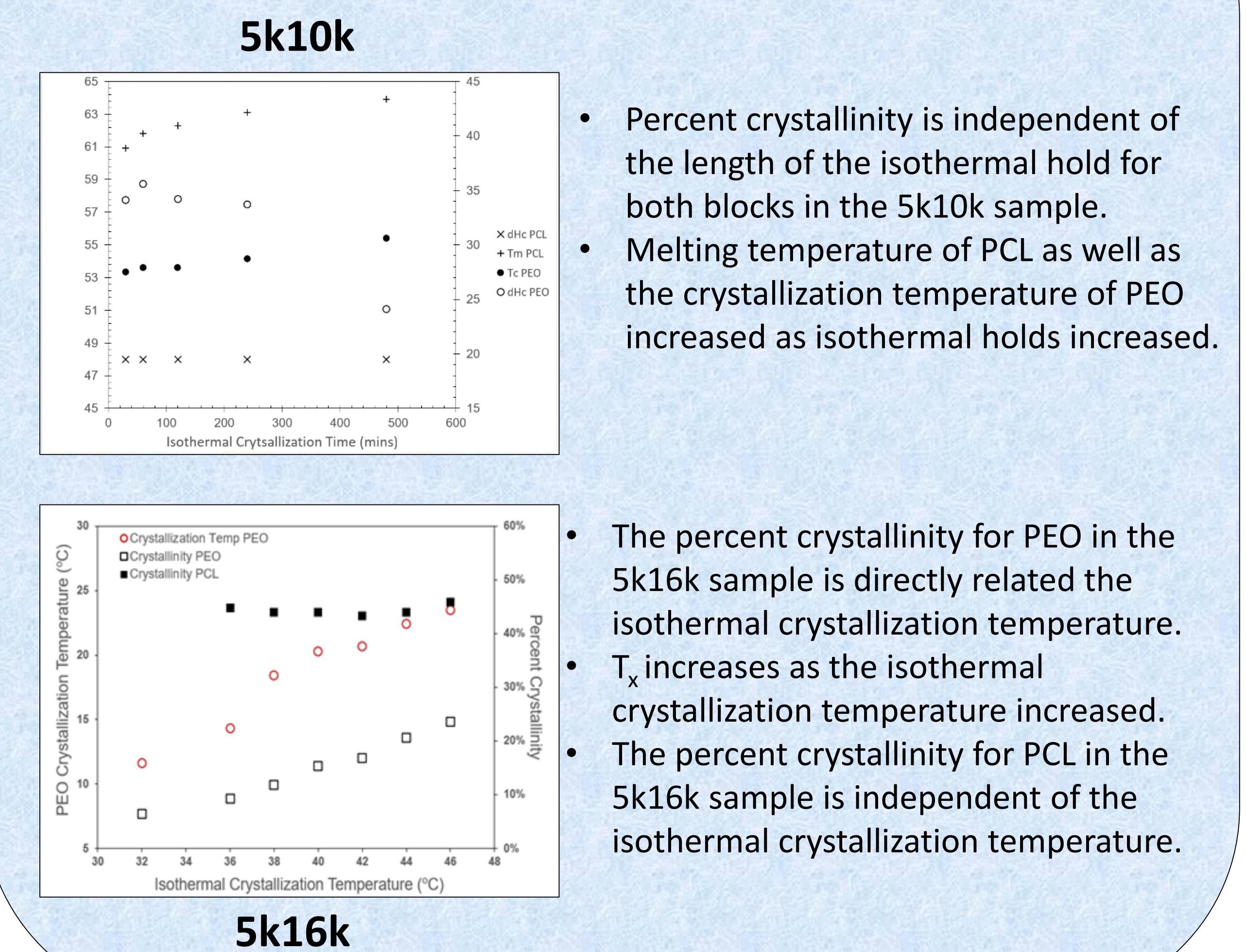
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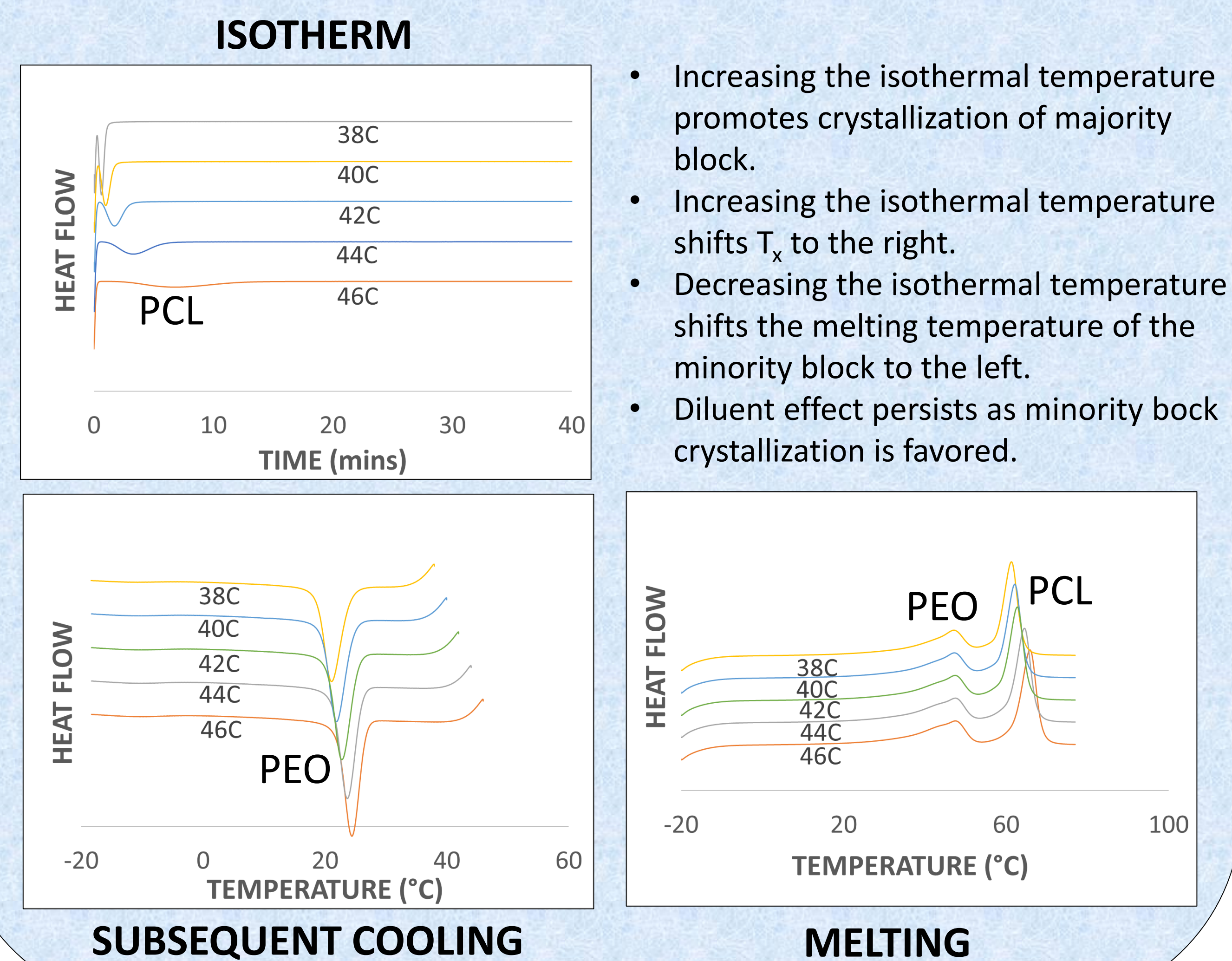
Varying the Time (5k10k)



Percent Crystallinity



Varying the Temperature (5k16k)



Future Work

