

The Impact of External Stimuli on the Molecular Trajectory of Micelles Residing at the Stability Boundary

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Abstract

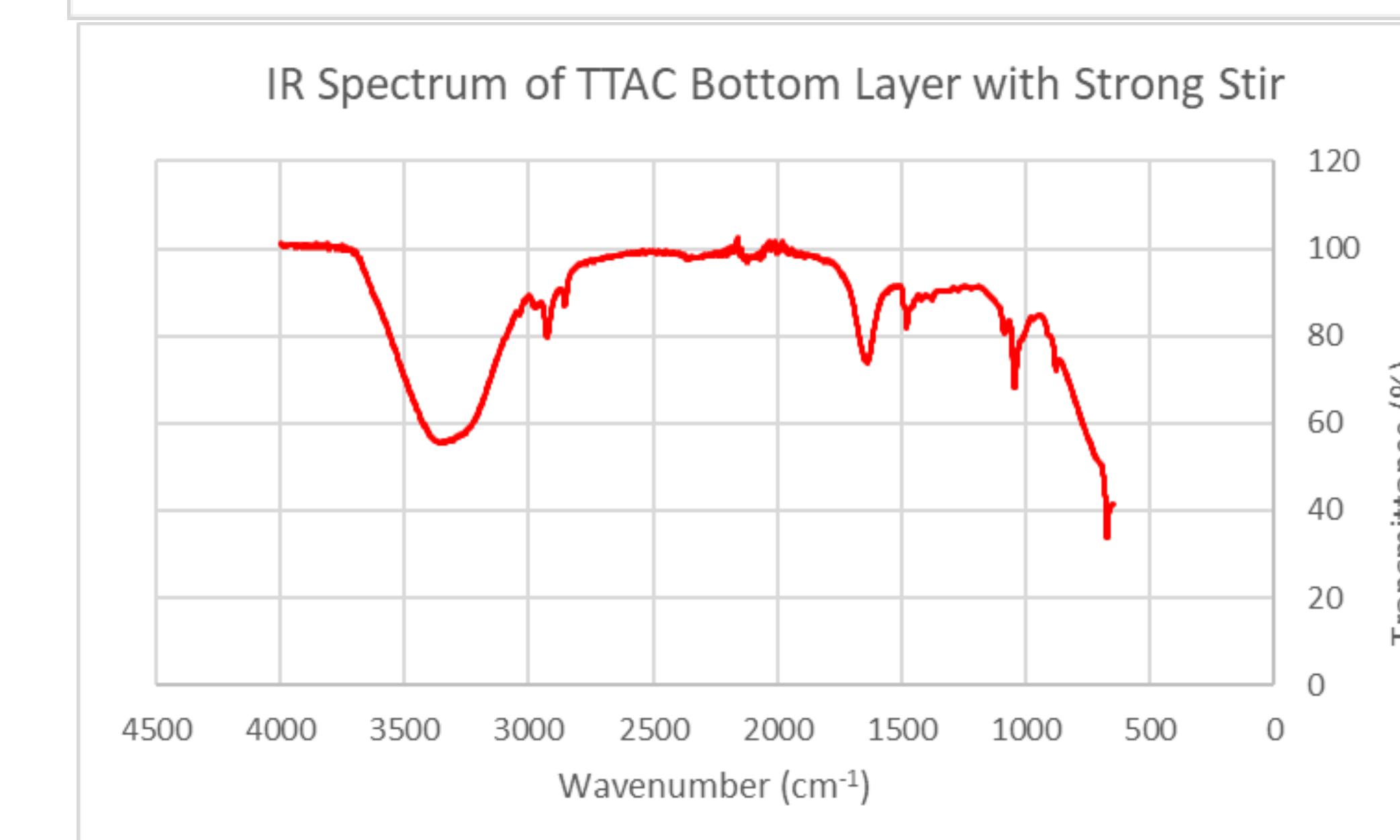
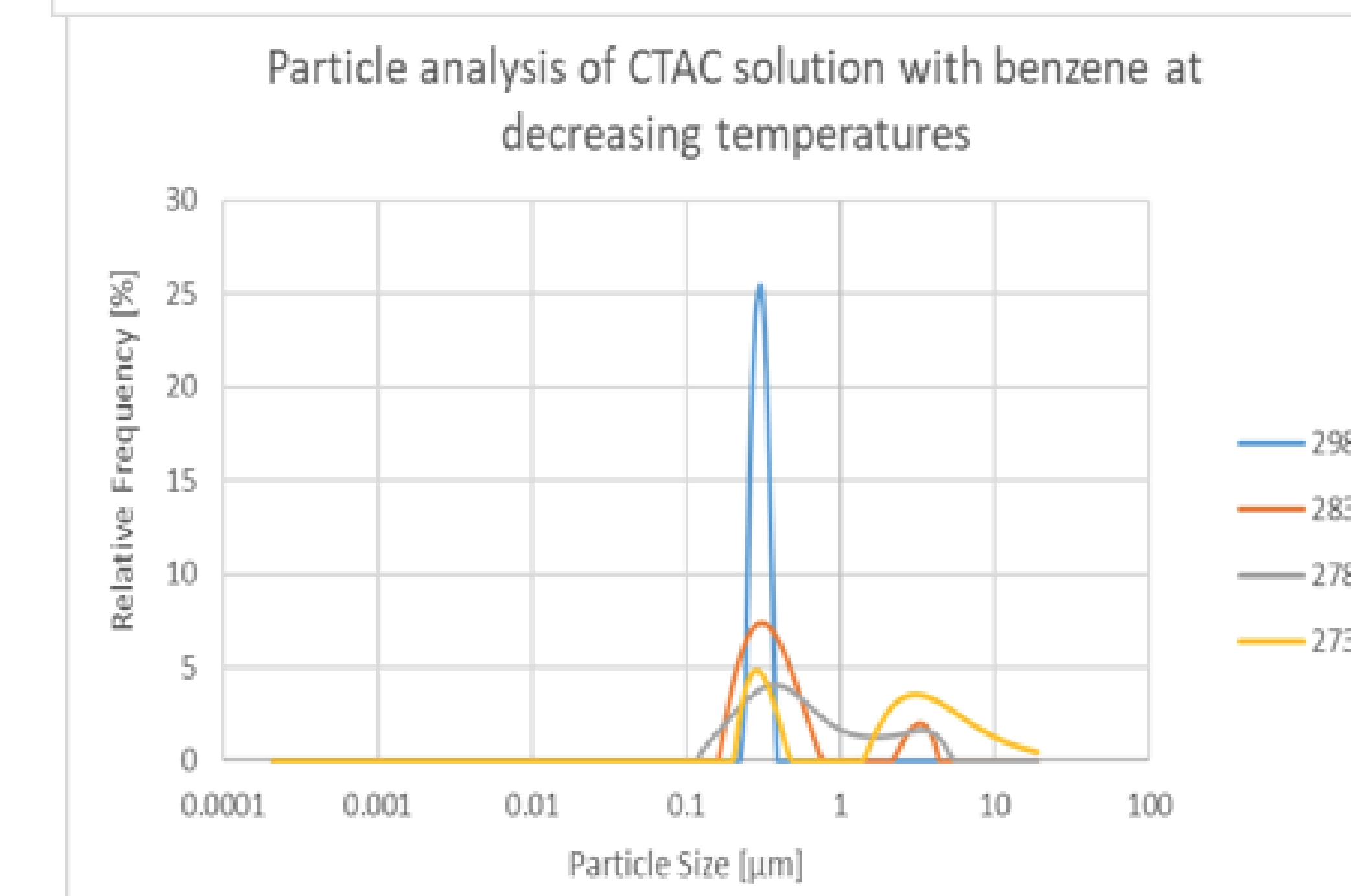
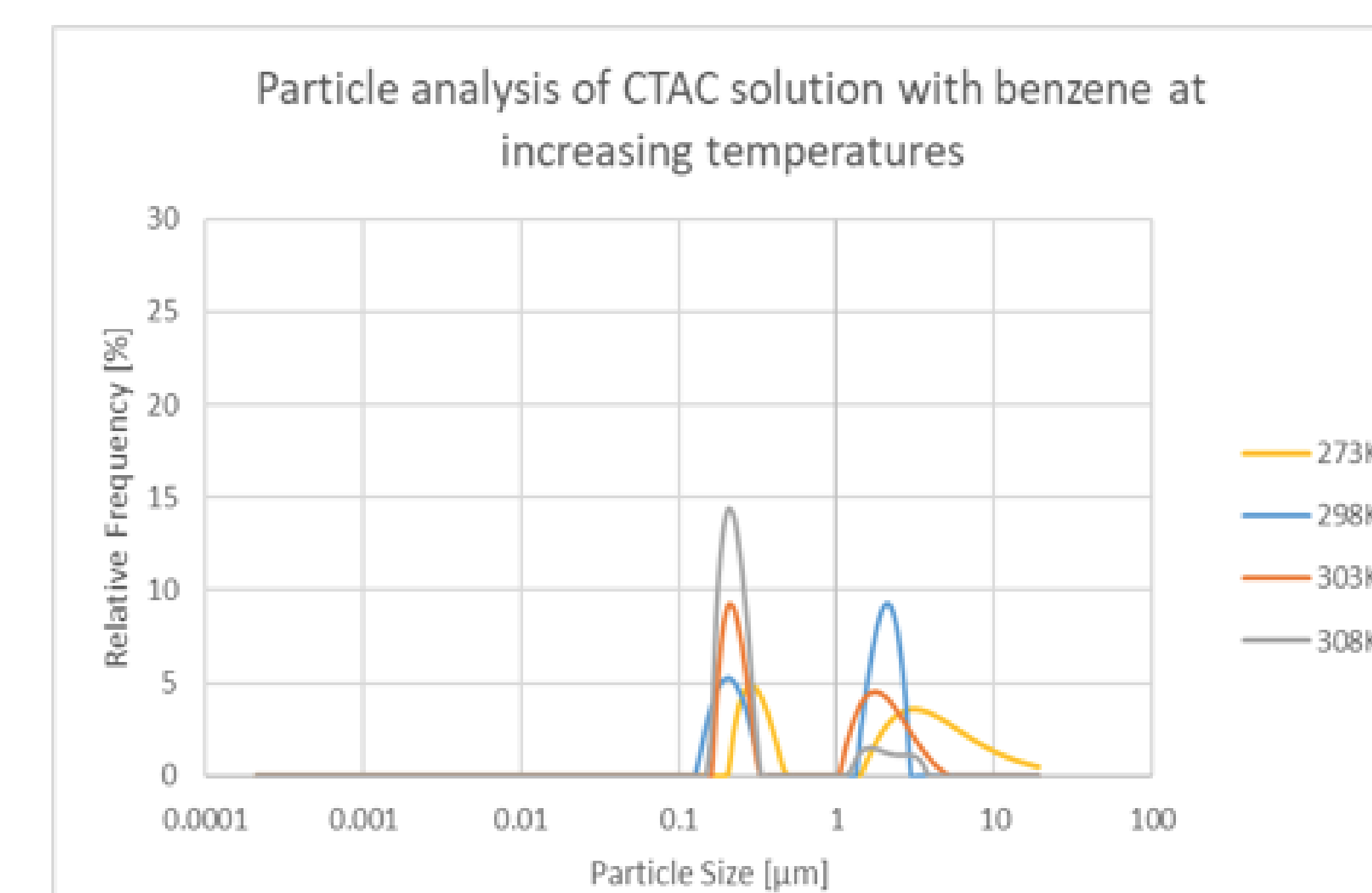
Self-assembly is a process by which molecules spontaneously arrange themselves in a specific way that is energetically stabilized via intermolecular interactions. The inherent hierarchical nature of self-assembly allow for a “bottom-up” method of molecular synthesis that can be very useful and applicable in many fields. Systems such as these are designed with the idea of modeling biological life and other complex systems, which require residing in an out-of-equilibrium state to function, which was studied here in this system in different ways such as altering stirring mechanisms as well as monitoring temperature changes. As long as logical consideration of the different additives into the system are made, there is a large range of materials that can potentially be synthesized with these principles.

Goals

- Confirm that the micelle system was operating in an out-of-equilibrium state
- Determine if a stirring mechanism affects the molecular trajectory of micellular formation
- Asses if different thermodynamic or kinetic pathways are active

Materials and Methods

We used cationic surfactants, decyl alcohol as cosurfactant, benzene as a chaotropic agent, and tetraethylorthosilicate as a reactive species. One set of solution was stirred vigorously and one stirred softly. The bottom layer(s) were collected and analyzed.



Conclusions

- Successfully created a two phase aqueous system
- Determined that the system being studied lies out-of-equilibrium
- Confirmed that different energetic pathways are active during temperature changes

Future Work

- Confirm that the stirring mechanism is what makes the aqueous two phase occur with regularity
- Determine if the phase formations are deterministic or probabilistic

