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Analysis of Thermoresponsive Dextrans via Small-Angle X-ray Scattering

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Thermoresponsive polymers have gained significant interest over recent years due to their potential use in a wide range of applications, including drug delivery, cell therapies, pharmaceuticals, tissue engineering, and mineral processing [1]. Of particular interest are thermoresponsive polysaccharides, which are generally biocompatible and biodegradable, unlike their synthetic counterparts. This is particularly important when considering biomedical applications, such as drug delivery, as biodegradability allows for the clearance of the drug delivery system from the body and can help to facilitate drug release. We have developed a novel family of thermoresponsive polysaccharides with tunable transition temperatures via functionalisation of non-thermoresponsive dextran with a series of alkylamides [2]. By altering the composition and degree of substitution of the alkylamide groups on the dextran backbone, the temperature at which phase transition occurs can be tuned. Upon heating, solutions of thermoresponsive dextrans undergo a reversable phase transition to afford colloidal suspensions. The nature of the solution-to-colloid transition was investigated by UV-visible spectrophotometry to determine the transition temperature and hysteretic effects, and via dynamic light scattering to determine changes in particle size and dispersity. To further interrogate the phase transitions and conformational changes occurring upon heating and cooling, Synchrotron small-angle X-ray scattering (SAXS) was conducted as a function of temperature. Taken together, these results provide a fundamental platform to further study the behaviour of these novel thermoresponsive dextrans when applied to specific applications, such as drug delivery or mineral processing.
1. Graham, S, et al., 2019, Carbohydrate Polymers, 207, p.143-159.
2. Otto, S, et al., 2021, Carbohydrate Polymers, 254, p.117280.

Level of Expertise

Student

Presenter Gender

Woman

Pronouns

She/Her

Which facility did you use for your research

Australian Synchrotron

Students Only - Are you interested in AINSE student funding

Yes

Do you wish to take part in the Student Poster Slam

No

Condition of submission

Yes

Primary author(s) : OTTO, Sarah (University of South Australia); GILLAM, Todd (University of South Australia); ALBRECHT, Hugo (University of South Australia); MARINA, Paula Facal (University of South Australia); BLENCOWE, Anton (University of South Australia)

Presenter(s) : OTTO, Sarah (University of South Australia)

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