

Influence of Pressure on Poly(N-isopropylacrylamide) Mesoglobules above Cloud Point

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The thermoresponsive polymer Poly(N-isopropylacrylamide) (PNIPAM) in aqueous solution forms dehydrated, smaller mesoglobules upon heating through their cloud point, at atmospheric pressure. On the other hand, at high pressures, larger clusters of PNIPAM mesoglobules are formed and are more hydrated [1]. Here, we explore the influence of pressure on the structural evolution and hydration of PNIPAM mesoglobules above the cloud point using very small-angle neutron scattering (VSANS). Strikingly, a critical pressure is observed at which a sharp transition between small mesoglobules and large clusters occurs and this transition pressure depends on temperature. Further, the formation of large clusters of mesoglobules from smaller ones is found to be not completely reversible. We conjecture that the pressure induced structural changes in PNIPAM mesoglobules could be due to the pressure dependent hydration and subsequent aggregation of mesoglobules.

Reference:

[1] B.-J. Niebuur et al., ACS Macro Lett. 6, 1180 (2017).

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