

## Temperature induces phase separation of poly(methacrylic acid) acid solutions : a multiscale approach

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Poly(methacrylic acid) (PMAA) is an interesting polyelectrolyte, the conformation of which may be tuned by pH and/or ionic strength. Concentrated solutions of PMAA have been reported a long time ago to form thermoreversible gels which are obtained at low pH when PMAA stands in its acidic conformation (degree of ionization~0) [1]. This temperature induced phase separation of concentrated PMAA solutions has been poorly addressed in literature. Both intermolecular hydrogen bonds between carboxyl groups on neighboring chains and hydrophobic interactions induced by the methyl group lead to physical cross-links that are assumed to be responsible for the gelation process. Rheological measurements on concentrated solutions of PMAA have shown the formation of a gel while heating, Figure(a). This behavior is associated with a LCST observed in a simple transmittance experiment using the same temperature ramp of 1°C/min, Figure(a). In order to assess the transition at a nanometric scale, SANS experiments were carried out on concentrated solutions at a temperature above the LCST, Figure(b). These results were also correlated with 2H NMR relaxation experiments performed on solvent molecules.

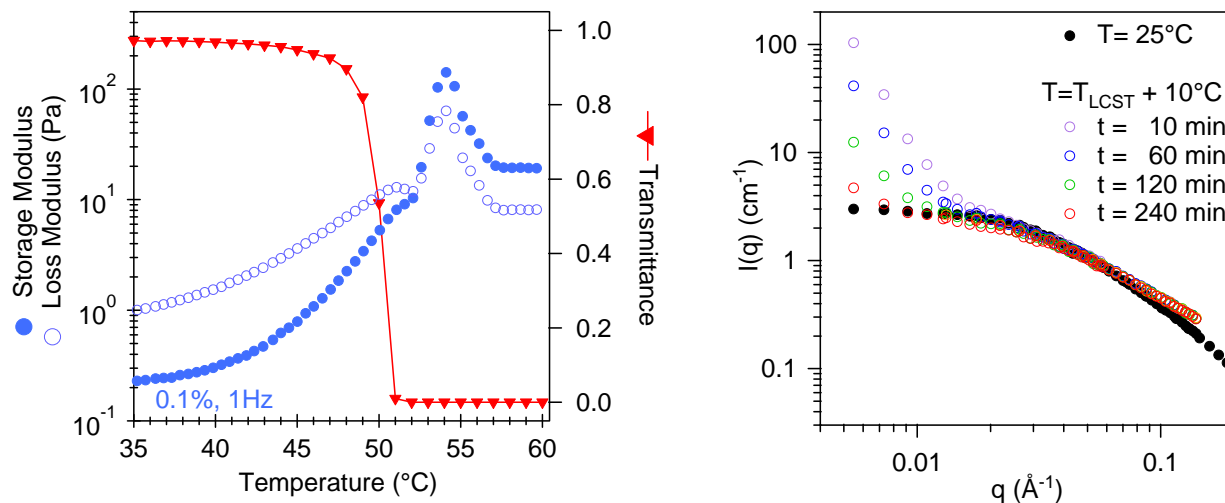


Figure: (a) 1°C/min temperature ramp of a 100g/l solution of PMAA in deuterated water at pH=3. (b) SANS curves of a 120 g/l solution of PMAA in deuterated water at pH=3 heating at 60°C.

1. Eliassaf, J.; Silberberg, A.; Katchalsky, A. Nature 1955, 176 (4493), 1119–1119.