Thermo-responsive interpolyelectrolyte complexes (IPECs): reversible colloidal structures governed by composition and temperature

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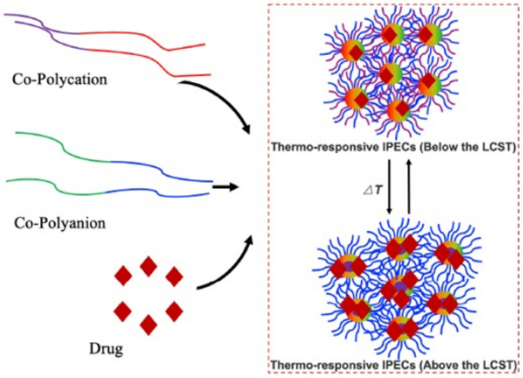
When two oppositely charged polyelectrolytes are mixed in an aqueous medium, cooperative electrostatic interactions lead to spontaneous formation of interpolyelectrolyte complexes (IPECs). IPECs can adopt various colloidal structures, which will depend on how the polymers interact with each other and the solvent (water). This means by adjusting the copolymer's Mw and segment ratio, the properties of the IPECs can be effectively tuned, thereby establishing a connection between polymer design and IPEC properties. [1-3] To develop IPECs for "targeted drug delivery" that have tunable solubilization properties and temperature-responsiveness, diblock copolymers (poly(2-acrylamido-2-methyl-1-propanesulfonic acid)-b-poly(N-isopropylacrylamide) (PAMPS-PNIPAM) and poly(2-methacryloyloxy-ethyltrimethylammonium chloride)-b-poly(ethylene oxide) (PMTAC-PEO)), with varying molecular weights and length ratios have been synthesized by us to form thermo-responsive IPECs with diverse morphologies. Light scattering and small-angle neutron scattering (SANS) experiments show that the co-assembled IPECs behavior varies not only with the mixing ratio, but also with molecular design and, most importantly, temperature, enabling thermally reversible control over the IPEC structure and thus a deeper understanding of how the IPEC structure can be precisely controlled, paving the way for their further development in targeted drug delivery.

Keywords:
IPECs, copolymers, thermo-responsive, reversible, SANS



Scheme of thermo-responsive IPCEs for drug solubilization and release

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