Temperature-Responsive, Shape-Transforming Nanostructured Particles

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Recently, colloidal particles that exhibit real-time tailored properties in response to external stimulus have recently been in the spotlight due to their diverse range of applications. Herein, we developed a simple and practical method for producing colloidal particle with temperature-driven transformation of shape and morphology via temperature-dependent assembly of polystyrene-b-poly(4-vinylpyridine) (PS-b-P4VP) block copolymer (BCP) and poly(N-isopropylacryamide) (PNIPAM) in an chloroform-in-water emulsion. Depending on the surrounding temperature, convex lens-shaped particle and pupa-like particle can be prepared by precise positioning of PNIPAM. At the lower temperature than LCST of PNIPAM, PNIPAM was dissolved from chloroform to water, producing convex lens-shaped particles with vertical cylinders. In contrast, the PNIPAM was localized preferentially in the P4VP domains in chloroform when the temperature is higher than LCST of PNIPAM, producing pupa-like particles with axially stacked lamellar.