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Poly(N-isopropyl acrylamide)

Poly(N-isopropyl acrylamide) (pNIPAM or pNIPAAm) is a thermoresponsive or "smart" polymer. This polymer has a lower critical solution temperature (LCST) of ~31ÂºC in an aqueous environment. Below this LCST, the polymer chains are well hydrated and have a random coil configuration Above the LCST, the polymer chains take on a much more compact configuration by sudden dehydration and increased hydrophobic interactions.

When grafted onto a solid surface this phase change can be controlled by applying an external stimulus (temperature). Above the transition temperature (i.e., physiological temperatures), the grafted polymer chains collapse, and the surface becomes relatively hydrophobic and protein-retentive. In addition, when pNIPAM surfaces are used for cell culture, biological cells (prokaryotic and eukaryotic) will adhere and proliferate. In contrast, below the phase transition (e.g. room temperature), a pNIPAM grafted surface becomes relatively hydrophilic and non-fouling to protein adsorption. Furthermore, cultured biological cells will release from the substrate without the need for harsh cell removal methods.

These pNIPAM-grafted surfaces offer a number of possible novel applications including cell patterning[1], controlled drug release[2], cell sheet detachment and tissue engineering[3, 4]. There are a variety of methods for modifying a surface with NIPAM including co-grafting with other polymers, polymerizing pNIPAM on to reactive surfaces, and deposition of plasma polymerized NIPAM (ppNIPAM).