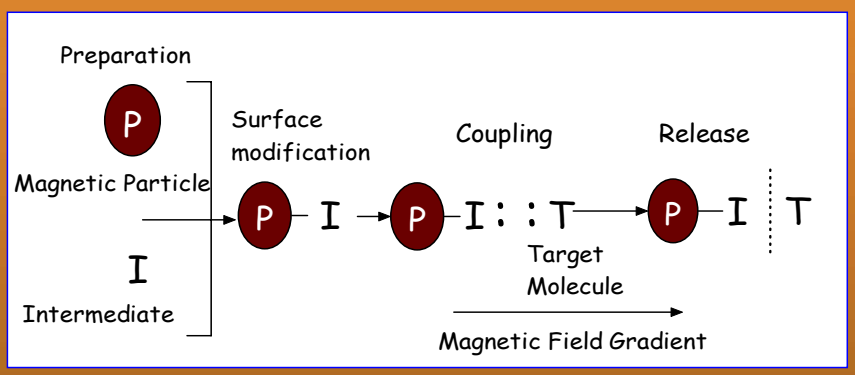
Department of Chemical &
Biomolecular Engineering

NUS National University of Singapore

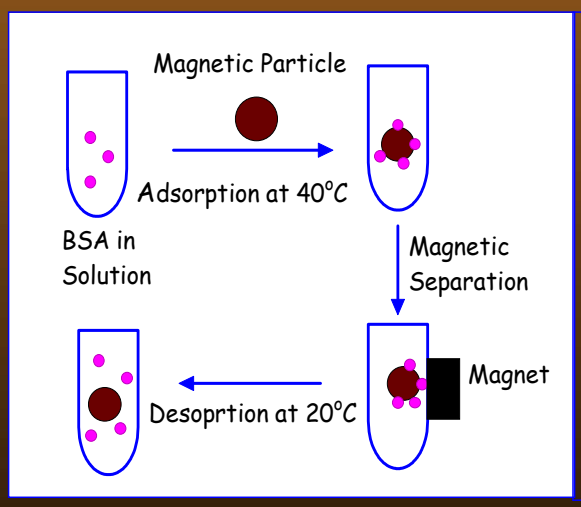
Surface Functionalized Nano-magnetic Particles for Bioseparation

The combination of organic inorganic components in a surface modified single magnetic particle at the nano-sized level and the unique and novel physicochemical features of these nanosized particles has made accessible an immense area of new functionalized materials. These functional monodispersed nanoparticels exhibit valuable properties such as large surface areas and high mobility as well as quick response therefore they have many potential applications, especially in biological field. However, we use thermosensitive polymer (N-isopropylacrylamide) coated magnetic nanoparticles in our bioseparation process. Basically, separation depends on the surface characteristics and magnetic properties of the particles.

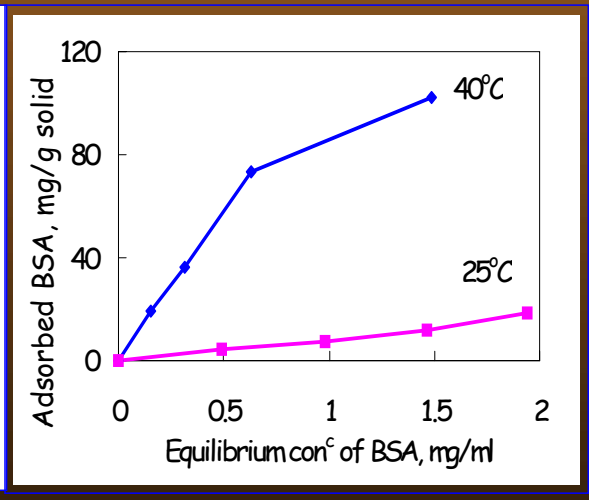


Schematic Diagram of Separation of Non-magnetic Target

Poly (N-isopropylacrylamide) has a critical solution temperature of 32°C in water, and changes from hydrophilic to hydrophobic above it, due to the reversible formation and cleavage of hydrogen bond between the amide group and the surrounding water molecule. This hydrophobic interaction is the major interaction involved in protein adsorption. Experimental results show that more proteins were adsorbed at higher temperature due to hydrophobic interaction.



Protein adsorption/desorption scheme



Adsorption changes with temperature

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