170e Development of Environmentally Sensitive Affinity Hydrogels for Bioseparations in Microdevices

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Abstract

Hydrogels have found numerous applications in microdevices owing to their phase transition behaviour. Phase transition of gels can be explained as an enormous change in the volume of the gels by absorption or desorption of solvent, due to infinitesimal changes in the environmental conditions (stimuli) such as temperature, pH and chemical potential. It is proposed to extend this interesting behaviour of hydrogels for protein separation. These gels when incorporated with affinity groups will have the ability to selectively retain and expel proteins. These affinity groups could be metals, aptamers or enzymes. This project is an initiative to develop hydrogels into smart bio-separation media with potential applications in sensors. In previous studies the concept of combining environmentally sensitive hydrogels and affinity groups has been shown using thermally sensitive N-isopropyl acryl amide (monomer) and acryl amide (co-monomer) which immobilizes iminodiacetic acid (affinity ligand). The iminodiacetic acid in turn chelates copper to which hystidine tagged proteins can bind. The present paper will focus on the synthesis of a novel vinyl iminodiacetate monomer and its in situ polymerization into N-isopropyl acrylamide gel matrix. These gels exhibit equilibrium swelling behaviour almost twice as much as the conventional gels and show much more uniform distribution of bound copper. The selective recovery of model proteins using these affinity hydrogels will be discussed. The techniques developed here will be then employed for the incorporation of affinity ligands into photmodulated hydrogels, which are under development.