Stimulus Responsive Fibrous Depth Filters for Protein Separations

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Dynamically tunable separation media can be a component of novel separation processes designed for specific applications. The ability to adsorb and desorb proteins from a solution with photodynamic or thermal stimuli can be very useful.

The present contribution describes the filtration or adsorption performance of a fibrous mat composed of cellulose fibers which have been coated with photo or thermoresponsive materials using the thermoresponsive polymer pNIIPAM. The adsorption efficiency of model protein, BSA is described under different response conditions to show effective adsorption and desorption.

A model for an interactive polymer brush anchored on the surface of cylindrical fibers in a cellulose fibrous medium is developed. The particle filtration efficiency for this novel filtration medium is modeled using homogenization and effective medium theory coupled with a local cell model.