Engineering selective gating of nucleoporin for bioseparation

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The nuclear pore complex (NPC) mediates macromolecular exchange between the cell nucleus and the cytoplasm. 99.9% of all large molecules (> 40 kDa) are rejected by the entropic barrier of NPC. Nevertheless, some of large molecules are permeated into the nucleus via an active mechanism assisted by transporters. Diverse soluble transport receptors interact with phenylalanine-glycine (FG)-repeat domains of nucleoporin in NPC, and permeates differently based on its affinity strength to FG repeats. The entropic barrier of NPC, and its transport-specific affinity allow selective and continuous bioseparation.
Here, entangled PEG mesh rejected entrance of non-specific polyclonal antibodies, and the conjugated peptides provide specific binding interaction with desired target molecules. Additionally, permeability of specifically interacting monoclonal antibodies is manageable by changing dissociation constant within the gel. The nucleoporin-based interactive filtering system exhibits great potential of highly difficult bioseparation, even between physicochemically similar biomolecules.