One-step selection of high-affinity aptamers using a non-fouling porous hydrogel

Aptamers are short single-strand DNA(ssDNA) that bind target molecules or families of target molecules specially. They have garnered great attention across different fields owing to their economical production and robust structural stability compared to antibodies. However, the selection of aptamer has been a challenging process due to numerous problems such as PCR amplification bias, ineffective partition, and nonspecific binding to the selection matrices. In our work, we have developed a novel aptamer enrichment and selection method using non-fouling hydrogel as matrices. Target molecules will be conjugated to a microporous polyethylene glycol(PEG) hydrogel for selection. After the ssDNA library is loaded, the candidates are allowed to diffuse out of the hydrogel. Low-affinity aptamer candidates are rapidly released from the hydrogel; however, high-affinity aptamers are slowly released. This difference in diffusion is attributed to their difference in the strength of binding to the immobilized proteins. Therefore, different aptamer candidates can be automatically separated during this diffusion-binding process for aptamer enrichment and selection.