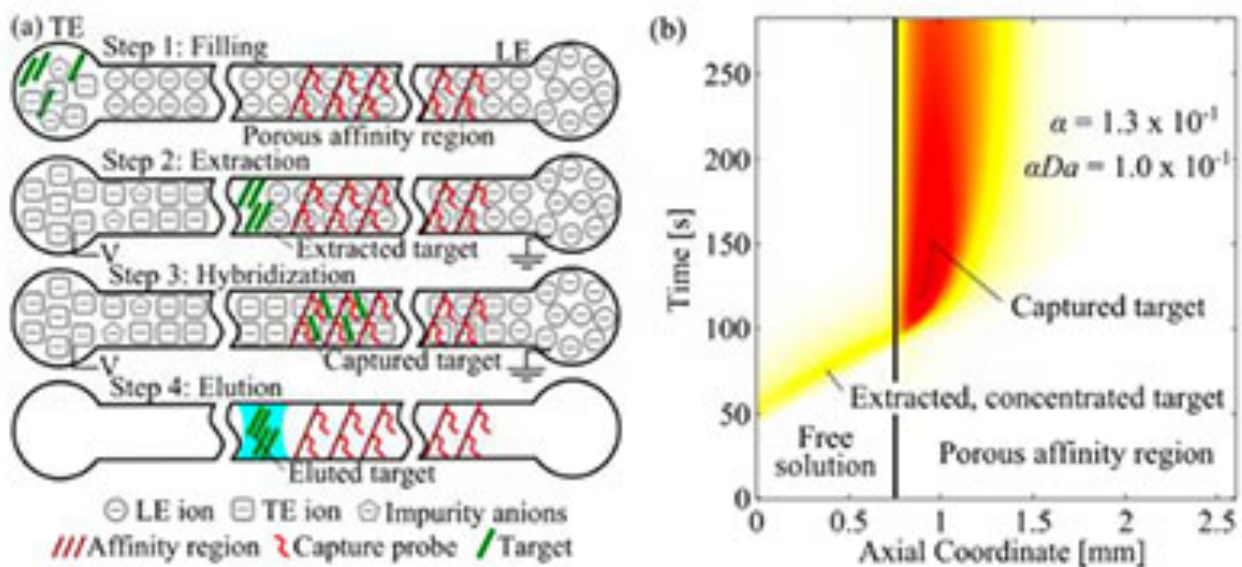


Fast, sensitive bioassays with microfluidics preconcentration of samples

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Technology description

To improve analysis, detection, and purification of biopolymers (e.g. nucleic acids, proteins). Researchers in Prof. Juan Santiago's laboratory have developed a technique to rapidly preconcentrate and capture biological targets with high specificity and efficiency. The process can be used to reduce reaction times for microarray analyses and affinity chromatography. The protocol includes isotachopheresis (ITP) to selectively focus target molecules as well as other strategies to achieve high efficiency capture of target. Specifically, the liquid phase is quickly displaced using gas flow to preserve the high capture rate achieved during a brief ITP reaction. The process increases sensitivity of assays and reduces the total ligand needed for detection and purification, thereby decreasing the cost of the assay. This microfluidics invention could be coupled with a variety of assays for rapidly purifying, detecting and analyzing proteins or nucleic acids for SNP analyses, biomarker discovery, or clinical diagnostics.



ITP-Affinity Chromatography schematic and results. (a) Illustration of assay for ITP-aided affinity chromatography. The target sample is loaded into the TE reservoir of the column and ITP focuses the target before it migrates into the affinity region to be captured by the probe and then eluted. (b) Experimentally measured target concentration showing dynamics of a typical ITP-AC binding experiment.

Application area

Microfluidics- protein or nucleic acid detection, purification and analysis with assays

Advantages

Fast- overcomes slow reaction kinetics for microarray assays or affinity purification in minutes (100 -1000x faster than conventional techniques)

Sensitive- concentrating the target molecules improves sensitivity 10 fold without increasing non-specific signal

Reduced cost- concentrated sample requires 100 – 1000x less ligand than standard affinity purification, thereby reducing reagent costs

High dynamic range- demonstrated targeted concentration over 4 orders of magnitude (1 pg/ μ L through 100 pg/ μ L)

Multiplexed analysis

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