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**Rapid and multiplexed enrichment of specific DNA sequences using isotachophoresis** ASHWIN RAMACHANDRAN, Stanford University, NOBUYUKI FUTAI, Shibaura Institute of Technology, CATHERINE HOGAN, KANAGAVEL MURUGESAN, NIAZ BANAEI, JUAN G. SANTIAGO, Stanford University — We use on-chip isotachophoresis (ITP) to create electric-field-driven shock waves of ion concentration, which are formed at the interface between a high mobility leading electrolyte (LE) and a low mobility trailing electrolyte (TE). Ionic species with mobilities bracketed by these electrolyte species focus at the LE-to-TE interface. For trace sample concentrations, multiple species co-focus, pre-concentrate by 10,000x and react inside a single, order 10 um wide zone. We apply ITP to extract and purify DNA targets from complex biological samples and to immediately co-focus these with synthetic DNA/RNA probes. We complete in 30 min hybridization reactions which would normally take several days, and then separate reacted from unreacted DNA. We will present our work toward rapid and sequence-specific enrichment of rare DNA targets for two applications. First, we enrich human genomic DNA regions associated with cancer using a large library of synthetic RNA probes. Second, we enrich pathogenic cell-free DNA from infected human plasma samples, followed by PCR to achieve highly sensitive and rapid detection of tuberculosis. The techniques presented have potential to streamline new diagnoses and discovery work in a wide range of areas including oncology and infectious diseases.

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