Life in the Shock Wave: Accelerating DNA Reactions with Electric Fields

Prof. Juan G. Santiago
Department of Mechanical Engineering
Stanford University

Tuesday, November 18, 2014. 4:15-5:15 pm
Building 300, Room 300

We use isotachophoresis (ITP) to create electric-field-driven shock waves of ion concentration inside microchannels. These waves 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 mix and co-focus inside a single, order 10 µm wide wave front. Multiple reactants can be mixed and then pre-concentrated by more than 50,000x in a few minutes to accelerate chemical reactions. We apply this technique to extract and purify DNA or RNA targets from complex biological samples and to immediately co-focus these with synthetic DNA probes that we design. We preconcentrate reactants by more than ~50,000x in a few minutes, and can complete in 30 sec chemical reactions which would normally take 4 days. Quantitation of the reaction product provides a sequence-specific detection scheme, and so the technique has applications to medical diagnostics and basic biological studies.

For more information please go to: http://microfluidics.stanford.edu

Refreshments available at 4pm. Seminar begins at 4:15 pm.
Questions: jjalonso@stanford.edu, x3-9954