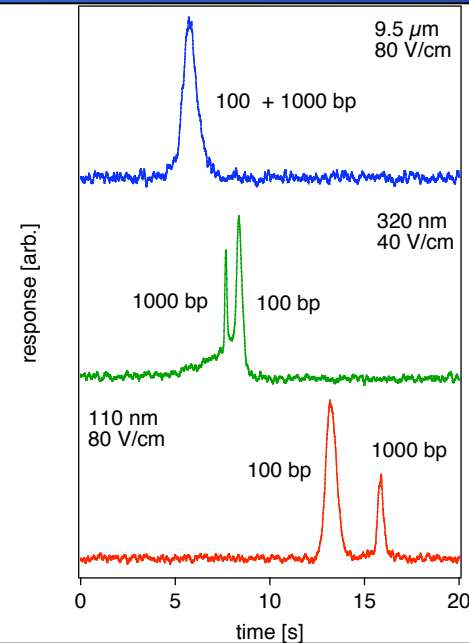


Transport in Nanoscale Fabricated Fluidic Systems

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Goals and Potential Impact if Successful

- Develop understanding of fluid transport in sub-100 nm conduits.
- Develop understanding of macromolecular transport through nanoscale fabricated channels.
- Potential technologies
 - Electrokinetics-based integrated hydraulic pumps for lab-on-a-chip devices
 - Concentration components for sample manipulation
 - Gel free sizing methodologies for biopolymers



**Biopolymer
Transport
Through 1D
Nanochannels**

$h \gg r_g$

$h \approx r_g$ $h = \text{channel half-height}$

$h < r_g$ $r_g = \text{radius of gyration}$

Approach and/or Accomplishments

- Fabrication of 1D and 2D nanochannels using top down methods in glass and silicon substrates
- Observation of fluid and macromolecular transport through single nanochannels under controlled conditions
- Electroosmotic transport observed under electrical double layer overlap conditions
- Size dependent mobilities observed for DNA molecules in nanochannels

Bottlenecks and Open Research Questions

- Methodologies must be developed to fabricate channels below 100 nm dimensions
- Tools for interrogating transport at molecular scale must be developed
- MD simulation tools capable of handling short and long length scales