

# CHEMICAL ENGINEERING

DISTINGUISHED YOUNG SCHOLARS SERIES



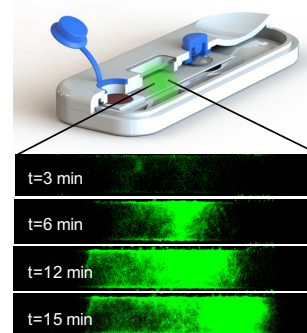
**MARK BORYSIAK**

**Monday, July 11, 2016**

Graduate Student  
University of Washington

## Point-of-care HIV-1 diagnostic: 15-minute nucleic acid extraction and amplification from whole blood using electrokinetic paper substrates

**ABSTRACT:** Nucleic acid amplification tests (NAATs) provide highly accurate diagnoses of infectious diseases. Despite the clear advantages of NAATs, most systems are restricted to central laboratories due to assay and instrumentation complexity. The logistics required for specimen collection, transport, and testing for lab-based NAATs typically delay obtaining diagnoses, and often lead to failed patient management. We have created an innovative NAAT that can potentially bring the speed and accuracy of NAATs to the point-of-care (POC) for improved clinical outcomes (Figure 1). Our technology is enabled by combining isotachopheresis (ITP) with recombinase polymerase amplification (RPA) on porous glass fiber substrates. ITP is an electrokinetic technique that separates and concentrates nucleic acids from complex samples into a focused band between two discontinuous buffers. RPA uses recombinase proteins to rapidly amplify nucleic acids at low temperatures. My presentation will discuss the needs and design constraints for developing POC diagnostics, particularly NAATs. I will present our work to create automated, low-cost NAATs for infectious diseases, including HIV detection from whole blood. The design and development of fluidics, electrolyte chemistry, and biochemical reagents for sensitive nucleic acid detection will be discussed. Overall, I will focus on our progress towards improving infectious disease diagnosis and patient care through the development of rapid and accurate diagnostic tests for POC applications.



**Figure 1.** ITP-RPA nucleic acid amplification on paper substrates

**LECTURE 4:00 - 5:00 (PAA) A110**  
**Happy Hour in Benson Hall Lobby Following**



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UNIVERSITY of WASHINGTON

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**BIOGRAPHY:** Mark is a 5th year Chemical Engineering graduate student in Prof. Jonathan Posner's lab at UW. He received a B.S. in Chemical Engineering from Ohio State University in 2011. His research interests include molecular assay development, point-of-care diagnostics, and electrokinetics.