

Abstract Submitted  
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**Transport Mechanisms of Circulating Tumor Cells in Microfluidic Devices**<sup>1</sup> KAUSHIK RANGHARAJAN, A.T. CONLISK, SHAURYA PRAKASH, The Ohio State University — Lab-on-a-chip (LoC) devices are becoming an essential tool for several emerging point-of-care healthcare needs and applications. Among the plethora of challenging problems in the personalized healthcare domain, early detection of cancer continues to be a challenge. For instance, identification of most tumors occurs by the time the tumor comprises approximately 1 billion cells, with poor prognosis for metastatic disease. The key obstacle in identifying and subsequent capture of circulating tumor cells (CTCs) is that the amount of CTCs in the blood stream is  $\sim 1$  in 109 cells. The fundamental challenge in design and fabrication of microfluidic devices arises due to lack of information on suitable sorting needed for sample preparation before any labeling or capture scheme can be employed. Moreover, the ability to study these low concentration cells relies on knowledge of their physical and chemical properties, of which the physical properties are poorly understood. Also, nearly all existing microfluidic mixers were developed for aqueous electrolyte solutions to enhance mixing in traditional low Re flows. However, no systematic studies have developed design rules for particle mixing. Therefore, we present a numerical model to discuss design rules for microscale mixers and sorters for particle sorting for high efficiency antibody labeling of CTCs along with presenting a pathway for a device to capture CTCs without the need for labeling based on particle electrical properties.

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