Title: A Micro-fluidic Device to Establish Concentration Gradients Using Reagents Density Differences

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Project Description:

Microfabrication has become widely utilized to generate controlled microenvironments that establish chemical concentration gradients for a variety of engineering and life science applications. In order to establish microfluidic flow, the majority of existing devices rely on additional facilities, equipment, and excessive reagent supplies, which together limit device portability as well as constrain device usage to individuals trained in technological disciplines. In this research project, the µLane system (two-layer poly-dimethylsiloxane) is developed to establish controlled chemical concentration gradients over time by relying solely upon differences in reagent densities. In addition, fluorescently labeled Dextran was used to validate the design and operation of the bridged µLane system by evaluating experimentally measured transport properties within the micro-system in conjunction with numerical and mathematical models. Our goal is often to manufacture devices that are easy to produce, minimize convective fluid flow, and maintain controlled gradients for extended periods of time. The results of this research have demonstrated that the bridged µLane system was used to generate spatial concentration gradients that resulted in an experimentally-measured Dextran diffusivity of 0.82±0.01 x10^-6 cm^2/sec.