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Electrokinetic Microstrirring to Enhance Immunoassays HOPE FELDMAN, MARIN SIGURDSON, CARL MEINHART, UCSB Mechanical Engineering — Electrokinetic microstirring is used to improve the sensitivity of microfluidic heterogeneous immuno-sensors by enhancing the transport in diffusion-limited reactions. The AC electrokinetic force, Electrothermal Flow, is exploited to create a circular stirring fluid motion, thereby providing more binding opportunities between suspended and wall-immobilized molecules. This process can significantly reduce test times, important for both field-portable biosensors and for lab-based assays. A 2-D numerical simulation model is used to predict the effect of electrothermal flow on a heterogeneous immunoassay resulting from an AC potential applied to two parallel electrodes. The binding is increased by a factor of 7 for an applied voltage of 10 Vrms. The effect was investigated experimentally using a high affinity biotin-streptavidin reaction. Microstirred reaction rates were compared with passive reactions. The measurements show on average an order of magnitude increase in binding between immobilized biotin and fluorescently-labeled streptavidin after 5 minutes. Therefore, this technique shows significant promise for reducing incubation time and enhancing the sensitivity of immunoassays.

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