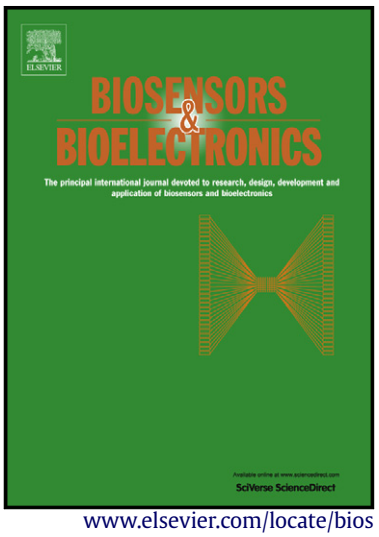

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Ramanathan Vaidyanathan, Sakandar Rauf, Muhammad J.A. Shiddiky, Matt Trau

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Tuneable surface shear forces to physically displace nonspecific molecules in protein biomarker detection

Ramanathan Vaidyanathan,[1] Sakandar Rauf,[1] Muhammad J. A. Shiddiky,[1]* and Matt Trau[1,2]*

[1]Australian Institute for Bioengineering and Nanotechnology (AIBN), Corner College and Cooper Roads (Bldg 75), The University of Queensland, Brisbane QLD 4072, Australia

[2]School of Chemistry and Molecular Biosciences, The University of Queensland, Brisbane, QLD 4072, Australia

Corresponding author(s): m.shiddiky@uq.edu.au (MJAS);m.trau@uq.edu.au (MT)

Abstract

We report a simple method to remove nonspecifically adsorbed species from sensor surface and also improve the detection sensitivity of the sensor using *tuneable* alternating current (ac) electrohydrodynamics (ac-EHD) forces. These forces generated within few nanometers of an electrode surface (*i.e.*, double layer) engender fluid flow within a serpentine channel containing a long array of the asymmetric electrode pairs, and can easily be tuned externally by changing the frequency and amplitude of the ac-EHD field. Under the optimized experimental conditions, we achieved a 3.5-fold reduction in nonspecific adsorption of non-target proteins with a 1000-fold enhancement in detection sensitivity of the device for the analysis of Human Epidermal Growth Factor Receptor 2 (HER2) protein spiked in serum. This approach can be applicable in diverse fields including biosensors, cellular and molecular separation systems and biomedical applications to remove/reduce nonspecific adsorption of molecular and cellular species.