# Supplementary Information

## Electrokinetic flow simulations

Electrokinetic flow has been used in this study for the transport of all samples and buffers. The electrokinetic behavior in the microchannel has been modeled with a two-dimensional finite element code (conductive media model[1] integrated with Navier-stokes equation[2]) using a commercial finite element software "COMSOL Multiphysics (COMSOL, USA)" to extract the parameters such as, voltages necessary for the uniform velocity in all the channels according to the channel dimensions. The representation ($C_n$, $V_n$) in Fig. 1S represents the respective channel numbers and voltages used in the simulation and experiments. The gold sensing islands have been set as "floating" during the simulation process. Since the area of gold is small compared to the total area of the channel, it does not show any macroscopic effects. However, the detailed evaluation of the simulated results shows the non-linear electrokinetic phenomenon.[3] The electric field lines intersect the gold islands at a certain angle. In reality, this might not be true as the gold islands are coated with polymers such as dextran. The boundry condition has been changed to "surface insulation" from "floating potential". In this situation, the later phenomenon has not been observed. Under steady state conditions, even without a dextran layer, the electrical double layer over the floating potential insulates the surface completely when the current drives positive ions towards one half side and negative ions to the other half side of the gold islands. In this situation, no electric field penetrates through the gold islands and electric field lines are tangential to the gold islands. When the electroosmotic slip was assumed, then the situation is different. However, simulations were carried out with no-slip boundry conditions.

The required flow velocity in each channel was set as 50 μm/sec and the voltage required to achieve such a flow velocity was estimated and applied in all experiments. The channel dimensions were chosen in such a way that there won't be electrochemical reactions near the gold islands due to current flowing over the gold.[4] The electroosmotic mobility was assumed to be $5\times10^{-8}$ $m^2/Vs$.[4] The electric field across each channel is ~9 V/mm. Our experimental result does not show any gold damage in this range. Also the dextran coating over the gold island prevents the electrochemical reaction up to a certain extent. For better understanding of this protection layer and electrokinetic effects on such layers, more experiments and theoretical analysis are necessary. iSPR experiments were performed with the known interactant pairs with the newly developed chip and are discussed here.

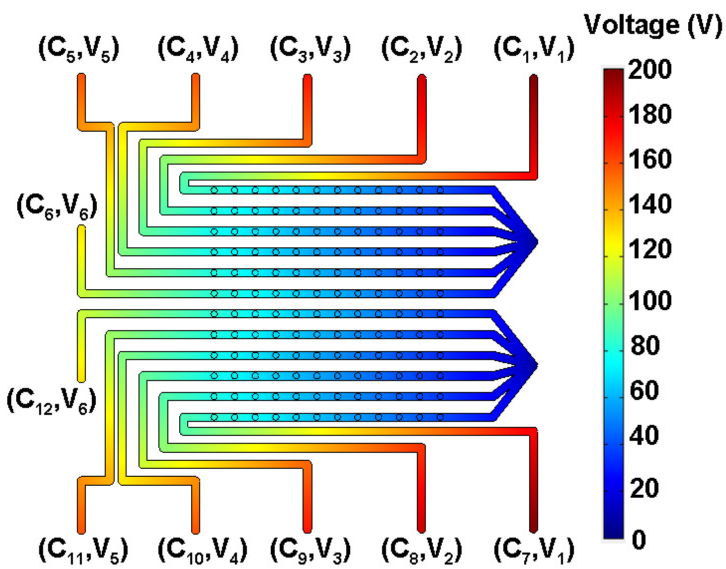


*Figure 1S Voltage profile across each channels using simulation of 2D Navier-Stokes equation with conductive media model (COMSOL, USA). To have uniform velocity in all the channels, the input voltages were calculated accordingly and are listed in table 1of the main article.*

## References

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(2) U. Ghia, K.N. Ghia, and C.T. Shin; J. Comp. Phys., 48 (1982) 387-411
(3) G. Soni, T.M. Squires, and C.D. Meinhart; Proc. of Comsol Users Conf., 2007.
(4) G. Krishnamoorthy, E.T. Carlen, D. Kohlheyer, R.B.M. Schasfoort, and A. van den Berg; Anal. Chem., 81 (2009) 1957-1963.