Heterogeneously integrated Silicon Nanowire Array for Biosensing Applications

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We present a miniaturized biosensor matrix system for the spatiotemporal detection of low concentrations of analytes, based on a high-density array (100 devices/mm^2) of ion- and charge-sensitive silicon nanowire field-effect transistors (SiNWFETs). The 32x32 individually addressable SiNWFETs are heterogeneously integrated on top of control and readout circuits, fabricated in CMOS technology [1-2]. Here we show parallelized sensing of dopamine (DA) molecules, down to femto-molar concentrations and with good selectivity.
This approach emerges as a promising route towards large-array nanowire sensor systems for high-resolution biosensing.

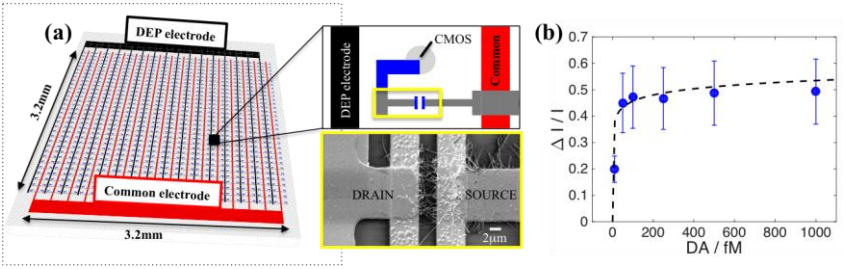

*Figure 1: Bundles of bottom-up grown, intrinsic SiNWs of ~20nm diameter were assembled by dielectrophoresis (DEP) on top of a CMOS chip [1-2]. **(a)** Sketch of the integrated array with single device view; **(b)** Relative transfer current ('ON' state) vs DA concentration, averaged across 832 SiNWFETs. The error bar is the standard deviation.*

REFERENCES

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2. *V. Sessi, F. Seichepine, S. Pregl, N. Szabo, A. Hierlemann, T. Mikolajick, W. M. Weber, and U. Frey, MicroTAS Proceedings, 2016.*