SUPPORTING INFORMATION for

Silicon Field Effect Transistors as Dual-Use Sensor-Heater Hybrids

Bobby Reddy, Jr*[1,2], Oguz H. Elibol*[4,5,&], Pradeep R. Nair[4,5], Brian R. Dorvel[1], Felice Butler[4,6], Zahab Ahsan[1], Donald E. Bergstrom[4,6], Muhammad A. Alam[4,5], and Rashid Bashir[1,2,3*]

[1]Micro and Nano Technology Laboratory, [2]Department of Electrical and Computer Engineering, [3]Department of Bioengineering, University of Illinois at Urbana-Champaign, Urbana, IL 61801

[4]Birck Nanotechnology Center, [5]School of Electrical and Computer Engineering, [6]Department of Medicinal Chemistry and Molecular Pharmacology, Purdue University, West Lafayette, IN 47907

* Authors have contributed equally

[&] Now at Intel Corporation, Santa Clara, CA.

Corresponding Author:

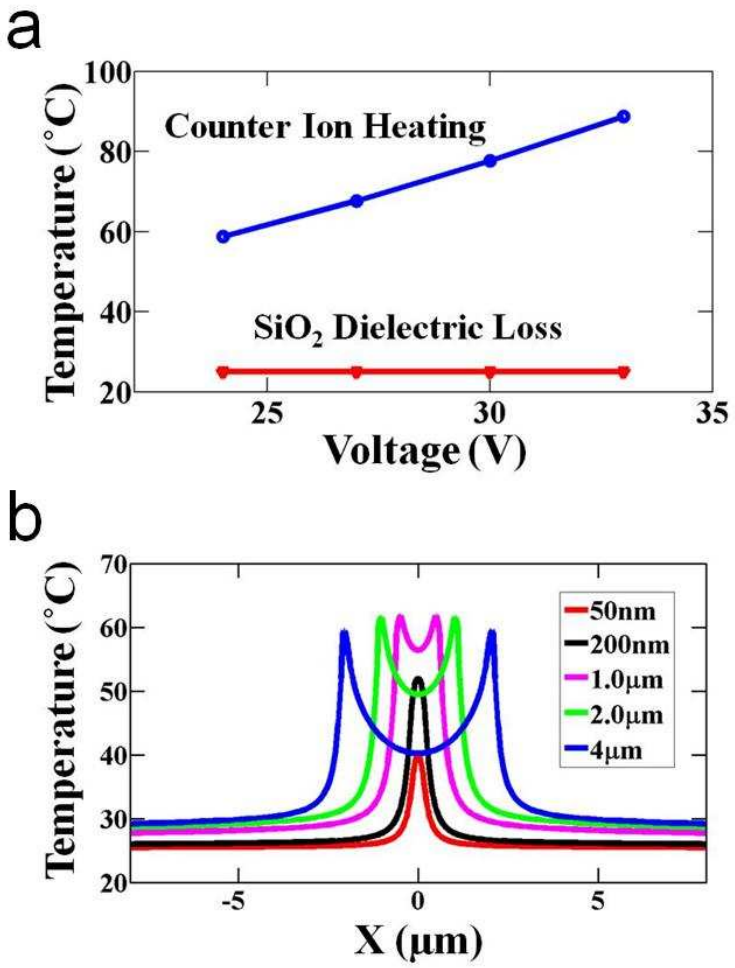
Rashid Bashir

E-mail: rbashir@illinois.edu

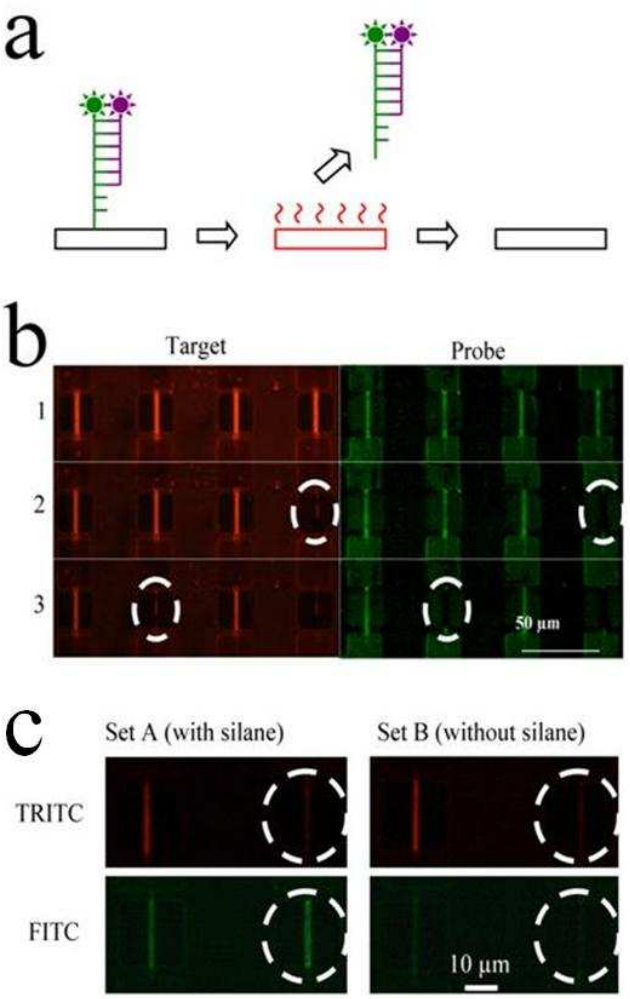
Mailing Address: 2000 Micro and Nanotechnology Laboratory, MC-249, University of Illinois at Urbana-Champaign, 208 North Wright Street, Urbana, IL 61801

Phone: (217) 333-3097

Fax: (217) 244-6375



SFigure 1: **a**, Simulation results showing that dielectric loss in SiO2 accounts for negligible heating – the primary mechanism is dielectric relaxation of the counter ions in the fluid. **b**, Simulation results for Device 1 (at 27V) indicate that as device width is scaled, the average temperature increases initially as the regions influenced by fringing fields forms a greater portion of active region and eventually thermal diffusion limits achievable surface temperatures.



SFigure 2: Control experiments for the desorption and refunctionalization experiments. **a**, Schematic summarizing the procedure for the heat mediated removal of the target-probe duplex from the surface. **b**, Fluorescent images showing the electrically addressable decomposition of the functional layer. The top image was taken before the experiment. Consecutive images are taken after heating the device encircled with dashed white lines. **c**, Images are shown depicting devices from Set A (left column) and Set B (right column) acquired with two different set of filters (TRITC – first row and FITC – second row) after the refunctionalization step. Devices on the right of each image were heated (encircled in dashed-white), and only set A (which was immersed in the silane solution) registers an improvement in the green fluorescence after refunctionalization with a sequence C modified with a FITC fluorophore. This lends evidence to the theory that the entire functionalization stack has lifted off after heating.