Supporting Information

Ultra-sensitive detection of adipocytokines with CMOS-compatible silicon nanowire arrays

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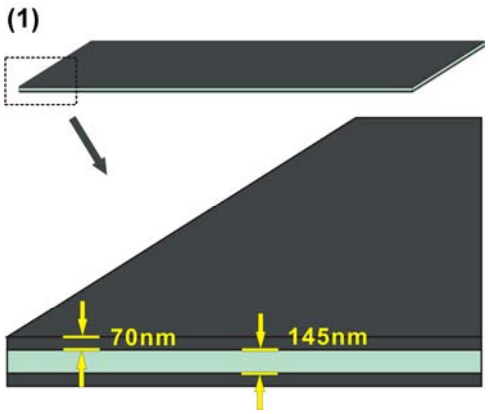
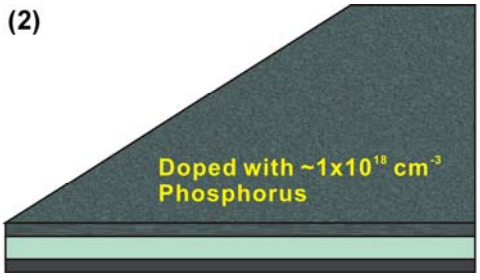
1. *Process flow diagram for fabrication of silicon nanowire arrays*

Colour representations for the materials used in the flow diagram.



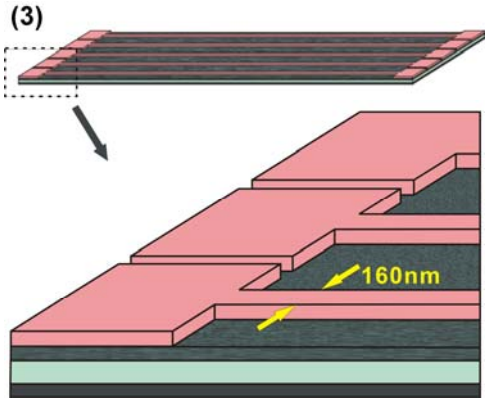
1. Silicon-on-insulator (SOI) wafer

SOI wafer with the device silicon layer of 70 nm thick and buried silicon-oxide layer of 145 nm thick.



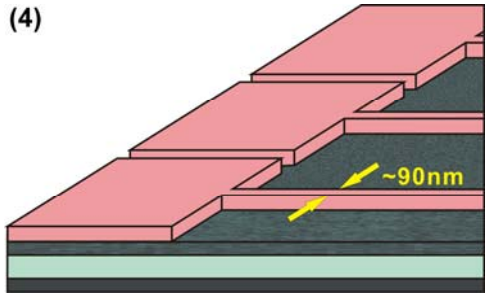
2. Doping of silicon

The resistivity of the silicon layer was adjusted by doping with *n*-type impurities (phosphorous) using an ion implanter to achieve a phosphorous ion concentration of ~1×10^{18} cm^{-3}. The dopants were activated by rapid thermal annealing at 1000 °C for 10 seconds.



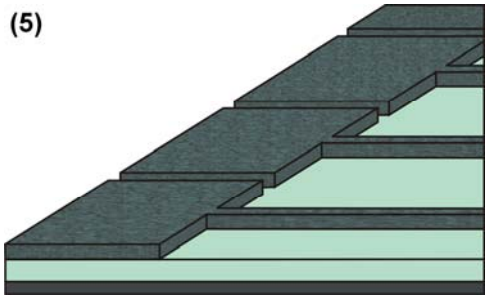
3. Photolithographic patterning of photoresist strips (mask)

Photoresist (PR) strips with critical dimensions of ~160 nm were patterned onto the silicon layer using deep ultraviolet lithography.



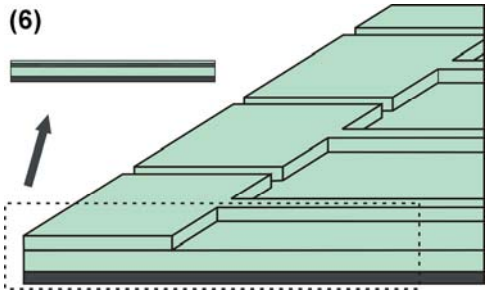
4. Resist Trimming

Photoresist strips were trimmed down to a dimension to of ~90 nm by controlled dry etching in oxygen plasma.



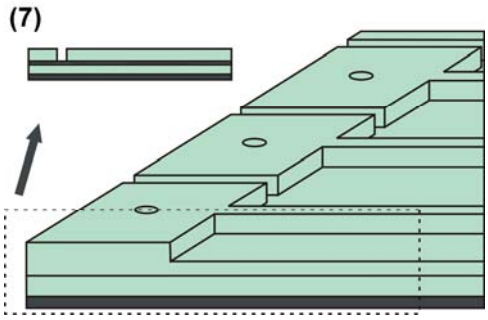
5. Nanowire formation

The resist pattern was transferred to the silicon layer using reactive ion etching.



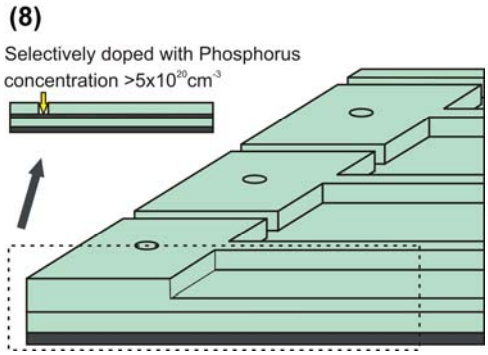
6. Thermal oxidation

To further reduce the critical dimension, the resulting silicon wires were oxidized at 900 °C.



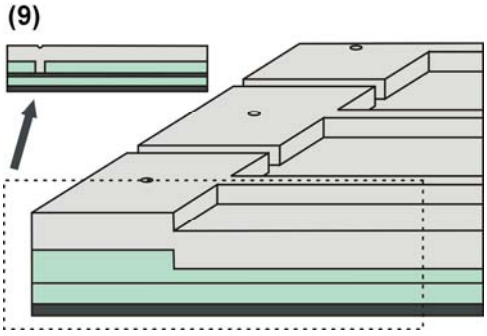
7. Pre-metal dielectric deposition and contact opening

Silicon dioxide was deposited on the device followed by contact opening which creates a small hole at the both ends of the fin structures to expose the nanowire structures for electrical connection.



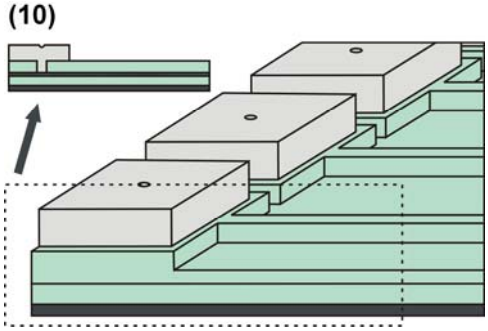
8. Selective doping of the contacts

The exposed contact points on the ends of the nanowire structures were selectively and heavily doped with phosphorous ions to a concentration >5×10^{20} cm^{-3}.



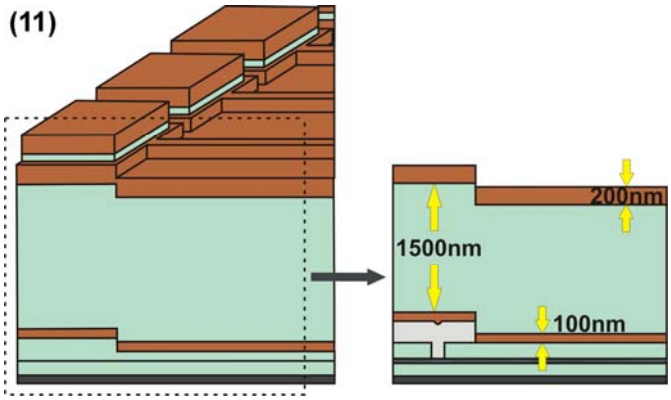
9. Metal deposition

Aluminium was deposited followed by alloying to achieve Ohmic contacts.



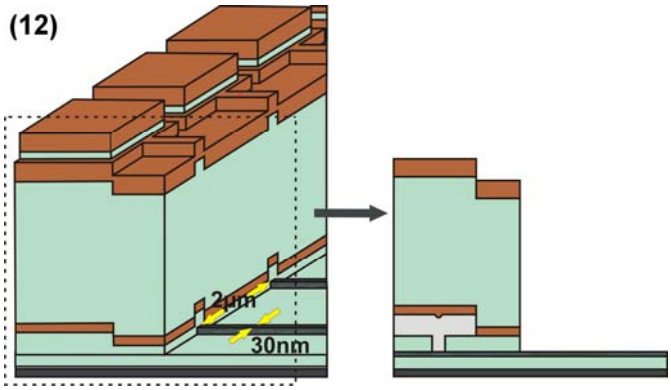
10. Formation of metal interconnects

Metal interconnects were made by photolithographic patterning and metal etching.



11. Passivation with Si_3N_4 and SiO_2

The device was sequentially covered by layers of silicon nitride (100 nm), high density plasma (HDP) silicon dioxide (1500 nm) layers, and silicon nitride again (200 nm).



12. Release of NWs

The nanowires were finally exposed through dry and wet etching. The completion of the whole process produces an array of silicon nanowires with a diameter of ~40 nm.

2. *Nanowire detection is specific*

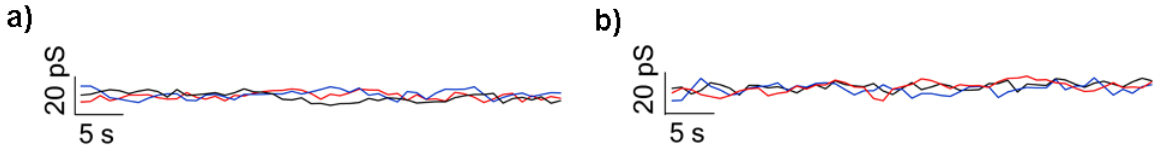


Fig. S1 The silicon nanowire modified with leptin antibodies (a) or resistin antibodies (b) did not response to bovine serum albumin (BSA) (100 μg/ml or 1.4 μM in PBS) and bovine serum (10% v/v in DMEM medium). The black line represents the nanowire conductance measured in 1 mM PBS without pre-treatment. The red line represents the nanowire conductance measured in 1 mM PBS after 30-minutes incubation with BSA solution. The blue line represents the nanowire conductance measured in 1 mM PBS after 30-minutes incubation with serum-containing medium.

3. *Differentiation of 3T3-L1 fibroblasts into adipocytes induced by hormonal stimulants*

Two days after the 3T3-L1 fibroblasts reached confluency (referred as day 0), the cells were exposed to the differentiation medium containing fetal bovine serum (10% v/v), insulin (10 μg/ml), dexamethasone (1 μM), and isobutyl-1-methylxanthine (0.5 μM), for 48 h. Cells were then maintained in the post-differentiation medium containing fetal bovine serum (10% v/v) and insulin (10 μg/ml). Differentiation can be confirmed by the morphology change of the cells and the appearance of fat droplets inside the cells. Cells on day 10, which were sufficiently differentiated, were used for the experiments.