[Supporting Information]

Universal Parameters for Carbon Nanotube Network-based Sensors: *Can nanotube sensors be reproducible?*

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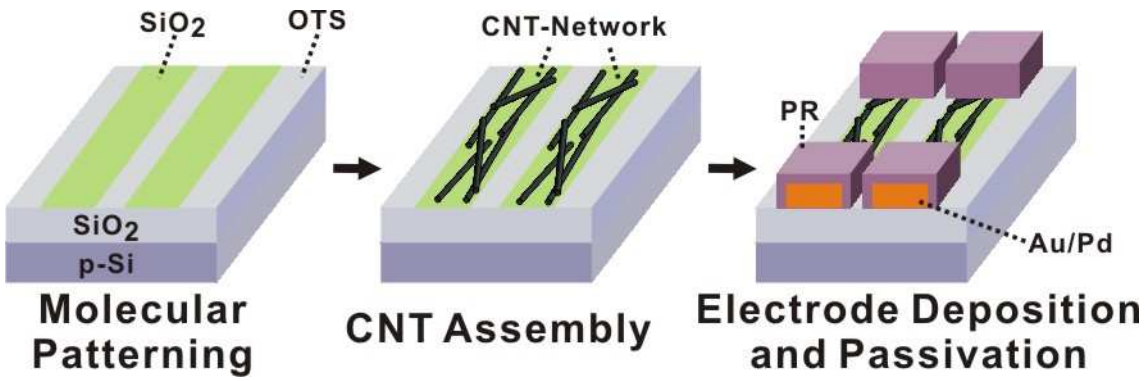

Figure S1. Schematic diagram of sample fabrication process. (a) Patterning hydrophobic octadecyltrichlorosilane (OTS) molecules on SiO_2 substrate. (b) CNT assembly on the bare SiO_2 regions by the directed assembly process. (c) Electrode formation and photoresist (PR) passivation.

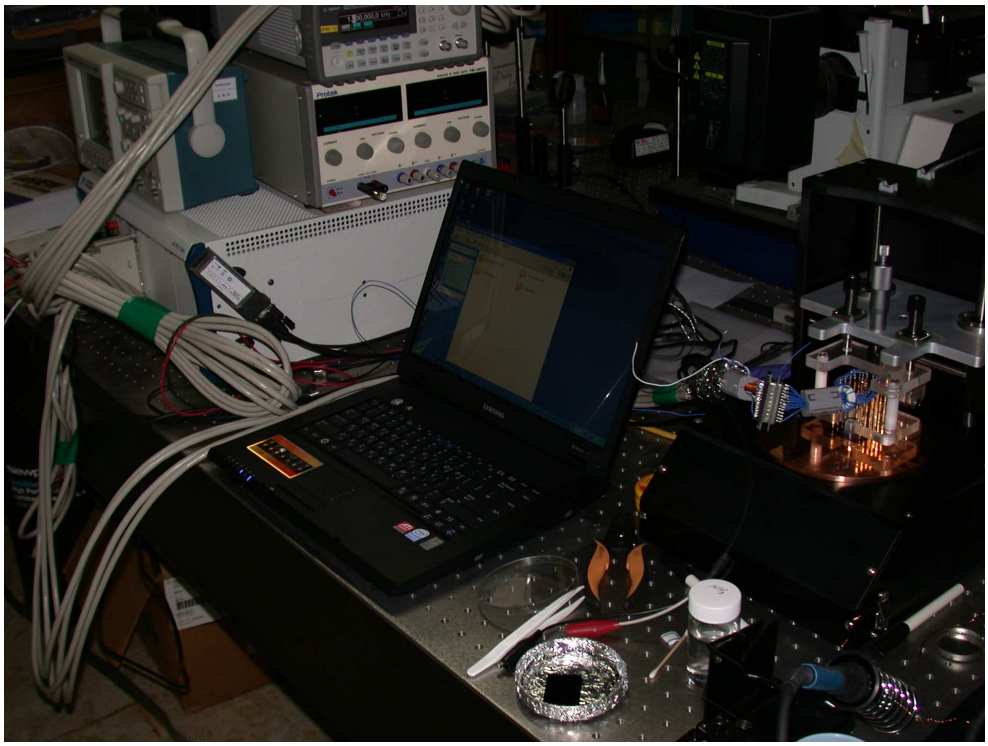

Figure S2. Multichannel measurement system.

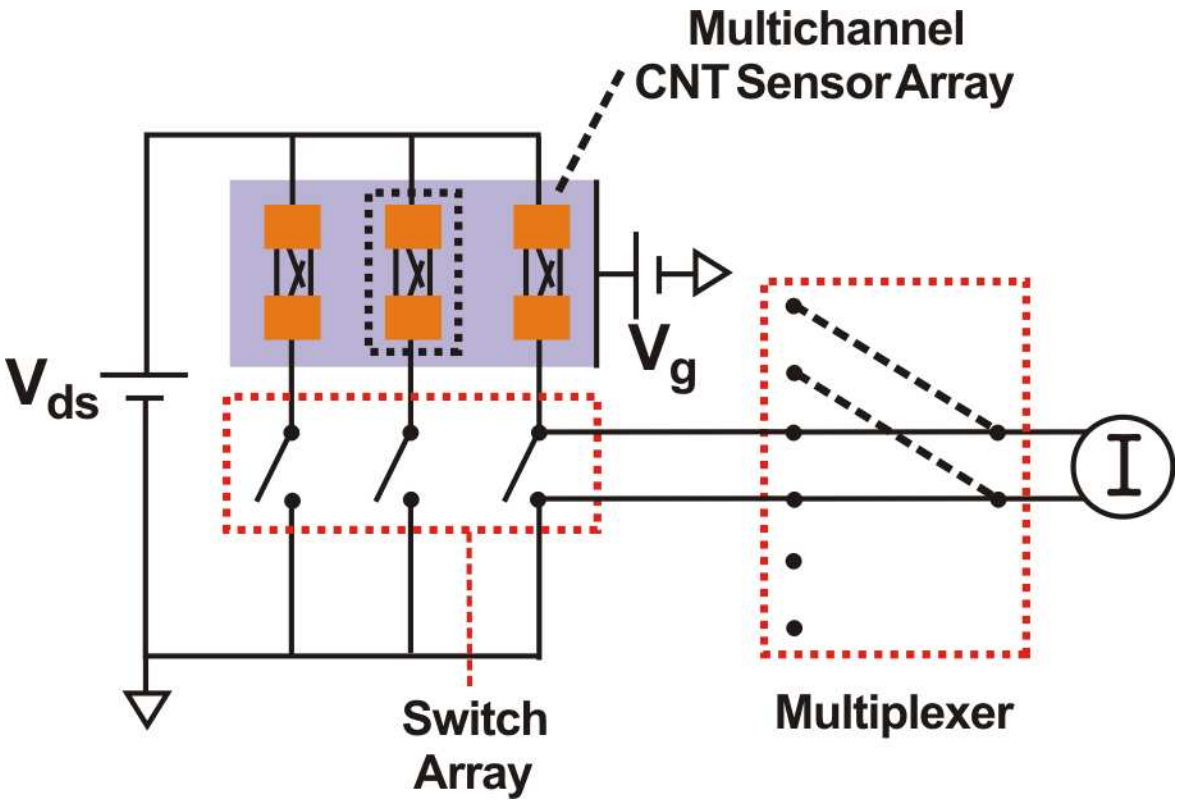

Figure S3. Schematic diagram of our multi-sensor measurement system. The multi-channel system consisted mainly of a home-made sample holding jig, power supply (E3631, Agilent, USA), switch array (PXI-2569, National Instruments, USA), multiplexer (PXI-2575, National Instruments, USA), a digital multimeter (DMM, PXI-4071, National Instrumets, USA) and a chassis (PXI-1044, National Instrumets, USA). The multi-channel measurement system was operated in either current monitoring mode (for sensor response measurement) or gate sweeping mode (for liquid gate measurement). In current monitoring mode, the current through each device was monitored and recorded. Here, the switches in the switch array were initially all shorted. Then, the multiplexer connected first to the junction to be measured, and then the switches were to be open. Afterwards, a single DMM sequentially read out the current flowing in each CNT junction. However, since the DMM had negligible impedance, the current to be measured was negligibly disrupted. This sequence was repeated for all the other junctions with a sampling rate of 10 samples/sec. For the sensor response measurement, the source electrodes of all CNT sensors were connected together to a common ground, and each drain electrode was connected to a switch with 0.1 V bias. In the gate sweeping mode for the liquid gate measurement, all the switches in the switch array were initially open, and the switches were closed sequentially, leaving only one switch being closed at a given time. For a given closed switch, a back-gate voltage V_g or a liquid gate voltage V_{lg} was applied to observe the gate response of the individual junctions. All the equipment was controlled with Labview (National Instruments, USA) program from a personal computer.

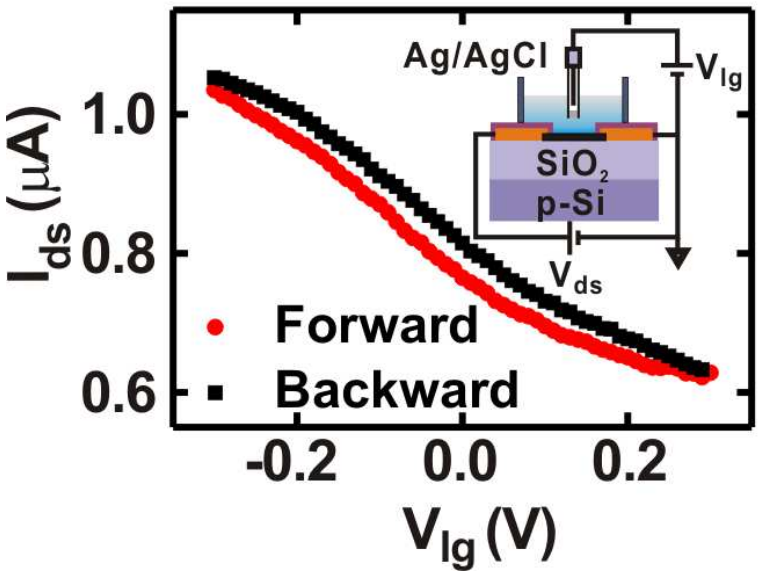

Figure S4. Liquid gate characteristics of a typical CNT network junction. The liquid gate voltage V_{lg} was swept from -0.3 V to 0.3 V with the source-drain voltage of V_{ds}= 0.1 V. The insert shows the measurement set-up for the liquid gate sweeping .

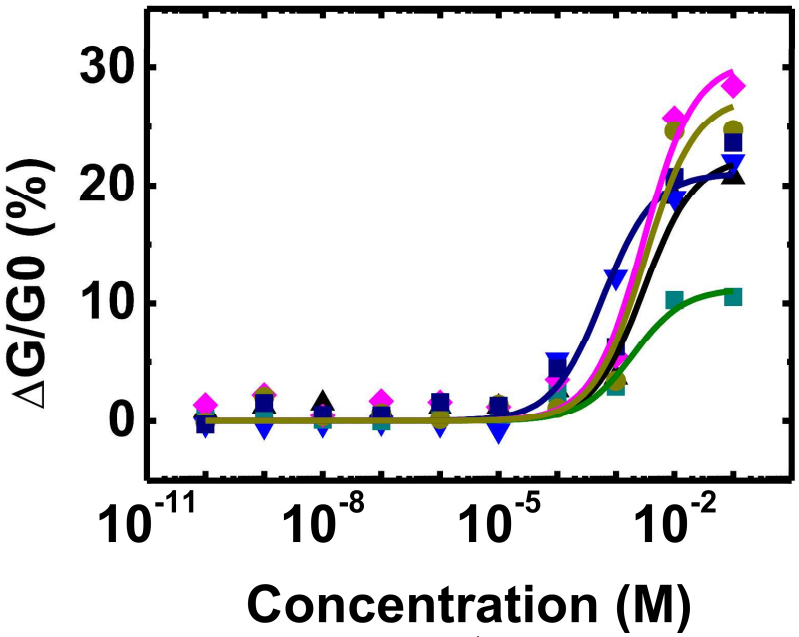

Figure S5. Sensor responses to ammonium ions (NH_4^+) with respect to concentration for six different CNT network junctions.