

Supplementary Information for:

***Molecular linker-free* directed assembly for high-performance integrated devices based on nanotubes and nanowires.**

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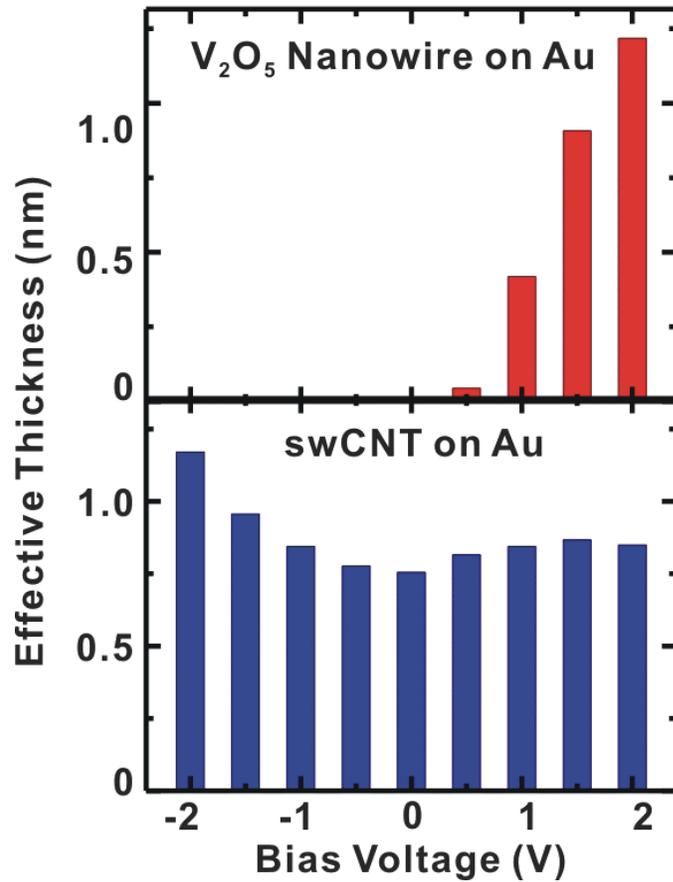


Figure S1. The effective thickness of adsorbed V₂O₅ NWs (top) and swCNTs (bottom) on Au surface under various substrate bias voltages.

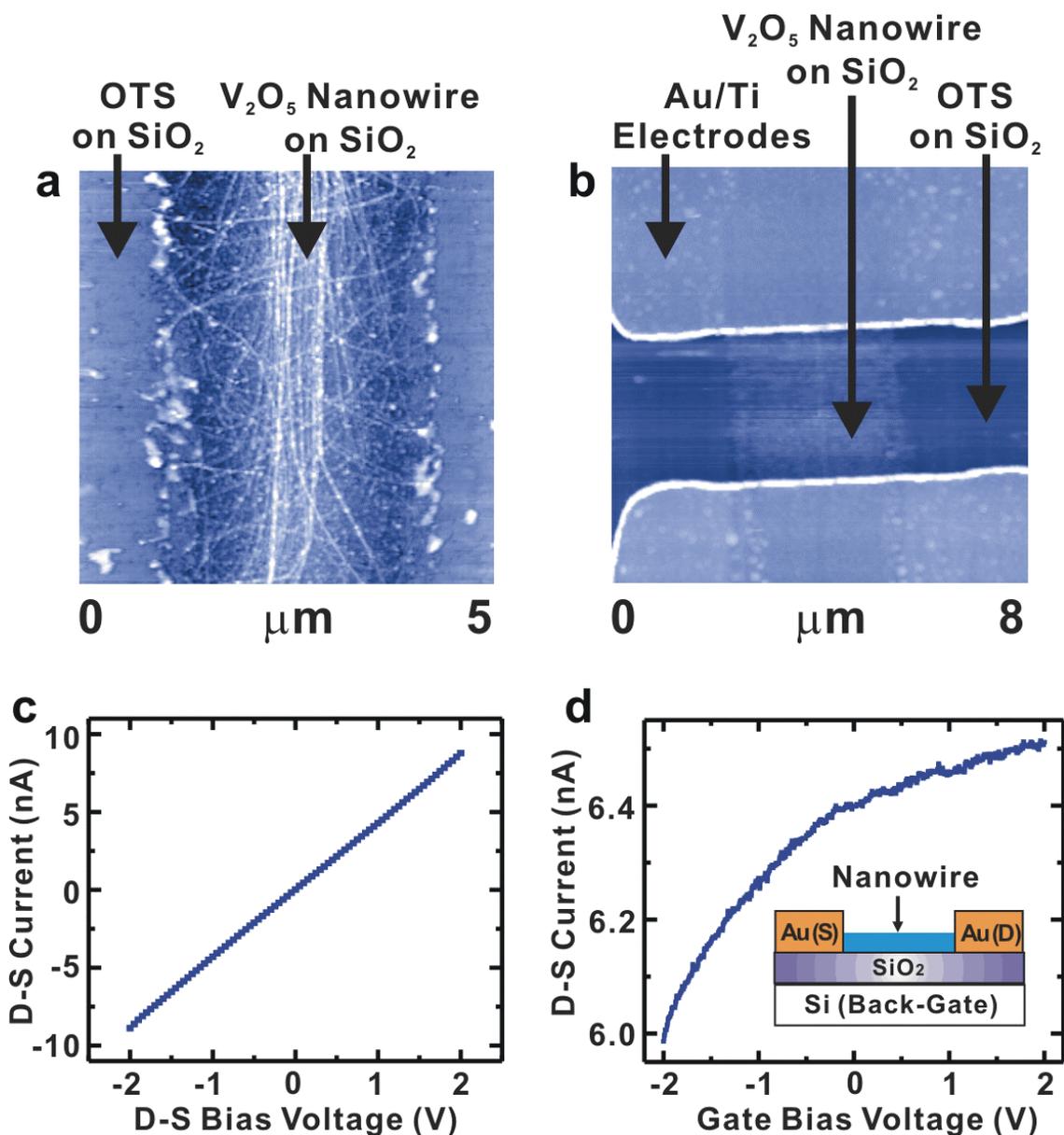


Figure S2. V_2O_5 NW-based devices. **a**, AFM topography image of V_2O_5 NWs adsorbed onto bare SiO₂ surfaces with OTS as passivation layer. 6 V is applied to the underlying Si substrate for NW assembly. The thickness of SiO₂ layer is 10 nm. **b**, AFM topography image of V_2O_5 NW junctions on SiO₂. **c**, Drain-source (D-S) current versus D-S bias voltage after annealing at 600 °C for 3 min. **d**, Gating effect using underlying Si substrate as back gate.

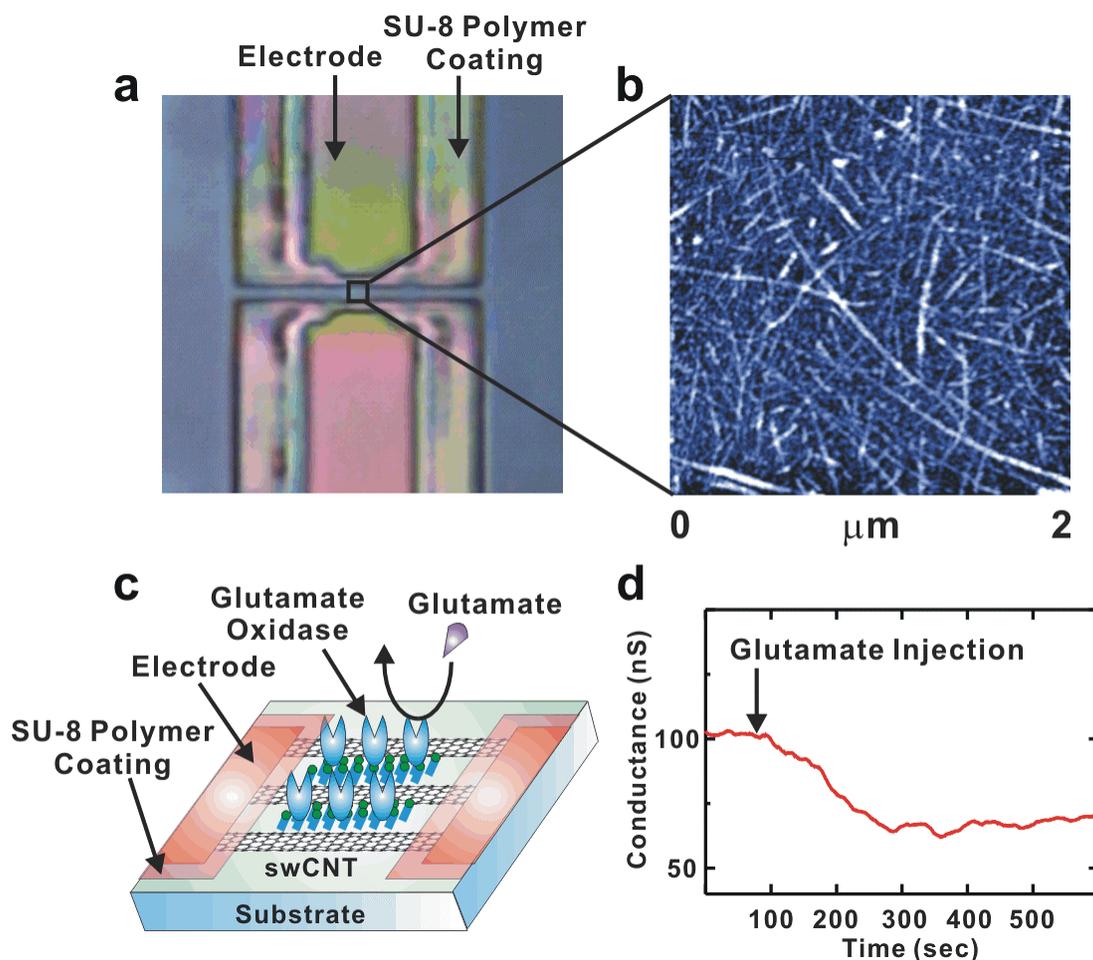


Figure S3. swCNT-based bio-sensors to detect glutamate. **a**, Optical micrograph of swCNT-based glutamate sensor. **b**, High resolution AFM topography image of swCNT networks with glutamate enzymes. In previous report, enzymes were attached onto swCNTs, while functionalization of swCNT surface was often a very difficult task. In our case, we attached glutamate oxidase directly onto bare SiO_2 surfaces between swCNTs. After swCNT junction fabrication, bare SiO_2 regions between swCNTs were coated with 3-aminopropyltriethoxysilane (APTES), and then glutaraldehyde was utilized as a linker between amine-terminated APTES surface and glutamate oxidase. **c**, Schematic diagram depicting the mechanism of glutamate sensor. The enzyme-coated swCNT junction was first placed in PBS solution. When the glutamate was injected into the solution, it was oxidized by glutamate oxidase and induces the gating effect to swCNT junctions. **d**, Response of swCNT-based sensor by the injection of 100 nM glutamate.

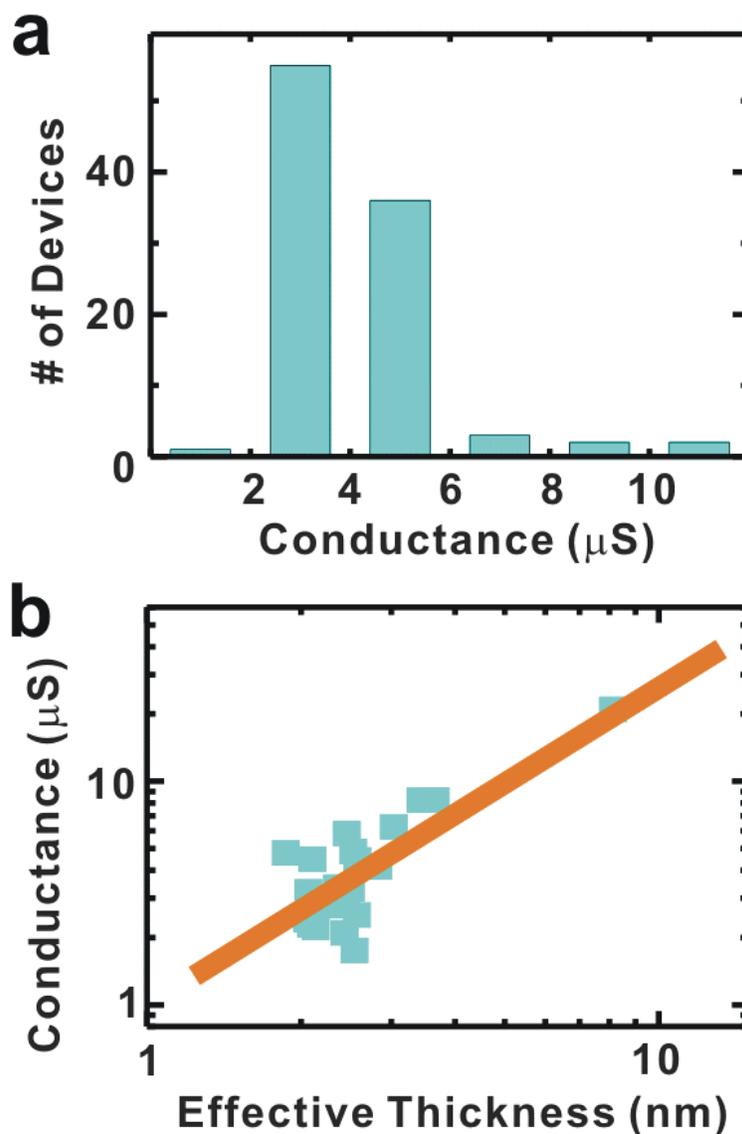


Figure S4. Uniformity of assembled swCNT-based devices with Au/Ti electrodes. **a**, Distribution of the conductance of one hundred swCNT junctions with Au/Ti electrodes. In each junction, two electrodes with 4 μm gap were connected by 3 μm wide swCNT patterns. **b**, Log-log plot of conductance versus effective thickness of swCNT junctions with Au/Ti electrodes. The slope of the log-log plot was found to be ~ 1.50 .