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Carbon nanotube biosensors strongly affected by the biosensitivity of quasi reference electrodes ETHAN MINOT, ANNE JANSSENS, IDDO HELLER, DIRK HEERING, CEES DEKKER, SERGE LEMAY, TU Delft — Semiconducting carbon nanotubes are extremely sensitive to their electrostatic environment. This property can be utilized to build sensors in liquid environments that detect bio-molecule adsorption in real time via changes in device conductivity. Control of the liquid potential is critical for operation of these sensors, yet nearly all carbon nanotube sensors operating in liquid have employed bare Pt wire to control the liquid potential. We show that the interface voltage between Pt and an electrolyte solution changes by tens of mV upon protein adsorption. This quasi reference electrode biosensitivity can easily mask signals associated with protein adsorption around the carbon nanotube. We demonstrate stable control of the liquid potential using a standard reference electrode, and report signals due entirely to protein adsorption around individual semiconducting NTs. These improved measurements allow us to quantify and differentiate the mechanisms of protein sensing by carbon nanotube devices.

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