

Abstract Submitted
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Identifying the mechanism of biosensing with carbon nanotube transistors ETHAN MINOT, Oregon State University — Carbon nanotube transistors have outstanding potential for electronic detection of biomolecules in solution. The physical mechanism underlying sensing however remains controversial, which hampers full exploitation of these promising nanosensors. Previously suggested mechanisms are electrostatic gating, changes in gate coupling, carrier mobility changes, and Schottky barrier effects. Each mechanism has its characteristic effect on the liquid-gate potential dependence of the device conductance. For devices that reveal ambipolar conduction, the sensing mechanisms can be unambiguously identified. Extensive protein-adsorption experiments on such devices show that electrostatic gating and Schottky barrier effects are the two relevant mechanisms, with electrostatic gating being most reproducible. If the contact region is passivated, sensing is dominated by electrostatic gating, which demonstrates that the sensitive part of a nanotube transistor is not limited to the contact region, as previously suggested. Such a layout provides a reliable platform for biosensing with nanotubes.

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