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Label-free Silicon nanowire field effect transistor for impedance-based sensing of molecules[1] YUAN WANG, QUAN QING, Arizona State University — Impedance biosensors are promising electrical biosensors due to low cost, ease of miniaturization and label-free operation. Recent investigations on impedance measurement yield a wealth of information about different molecular motion and relaxation process, utilizing a wide frequency range from 10uHz to 1THz, which typically measure the impedance between two large chemically modified electrodes as target molecules bind to the surface. Our question is: can we scale this method down to single molecule level by matching the size of the whole device with that of the target molecules, which falls in the 10-100 nm length scale, and integrating the amplifier directly within such nano-electrodes? Here we will show our prototype devices based on silicon nanowire field-effect transistors (SiNW FETs) with a paired-gate structure. We will discuss the basic characteristics of these devices and demonstrate proof-of-concept results of pH sensing with high-frequency gate modulation. Our results will be further developed to a new platform for the enrichment and detection of low-copy biomolecules in physiological environments.

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