Abstract Submitted
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Nanoribbon field-effect transistors as direct and label-free sensors of enzyme-substrate interactions[1] LUYE MU, Electrical Engineering, Yale University, ILIA DROUJININE, Genetics, Harvard Medical School, NITIN RAJAN, SONYA SAWTELLE, Applied Physics, Yale University, MARK REED, Electrical Engineering and Applied Physics, Yale University — The ability to measure enzyme-substrate interactions is essential in areas such as diagnostics, treatment, and biochemical screens. Many enzymatic reactions alter the pH of its environment, suggesting of a simple and direct method for detection. We show the ability of Al_2O_3-coated Si nanoribbon field-effect transistor biosensors to sensitively measure various aspects of enzyme-substrate interactions through measuring the pH [2]. Urea in phosphate buffered saline (PBS) and penicillinase in PBS and urine were measured to limits of <200 μM and 0.02 units/mL, respectively. We also show the ability to extract accurate kinetics from the interaction of acetylcholine and its esterase. Prior work on FET sensors has been limited by the use of surface functionalization, which not only alters enzyme-substrate affinity, but also makes enzyme activity quantification difficult. Our method involves direct detection of reactions in solution without requiring alteration to the reactants, allowing us to obtain repeatable results and sensitive limits of detection. This method is a simple, inexpensive, and effective platform for detection of enzymatic reactions, and can be readily generalized to many unrelated classes of reactants.

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[2]L. Mu et al., **Nano. Lett.** 14, 5315

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