

## **Nano- and micro-structured aptamer-field-effect transistors for implantable and wearable biomarker sensing**

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We developed field-effect transistor sensors functionalized with oligonucleotide receptors for small molecule sensing in high-salt physiological environments. We fabricate hard and soft materials to produce implantable and wearable devices with FET sensors. We fabricated multi-FET probes on Si in 150  $\mu\text{m}$  x 150  $\mu\text{m}$  and 50  $\mu\text{m}$  x 50  $\mu\text{m}$  formats. Both are stiff enough for tissue implantation, while the smaller format possesses flexibility. Moreover, we fabricate nanoribbon transistors on hard and flexible substrates, including polyimide, polyethylene terephthalate (PET), and novel temperature-responsive polymers. We have used soft formats for sensing in brain tissue and spinal cord, and for wearable devices. We demonstrated multiplexed serotonin, dopamine, pH, and temperature sensing via nanoribbon PET sensors. These efforts are enabling us to move toward multiplexed implantable and wearable sensing devices for use in animals and humans to improve understanding of behaviorally relevant information encoded by chemical modulators.