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ZnO Thin-Film Transistors as a Transduction Platform for an Electronic Nose[1] MICHAEL ALDRIDGE, PRAKASH GAJUREL, FABIOLA AL-IBRAHIM, EVERETT DALY, DAVID LEDERMAN, LETHA SOOTER, CERASELA-ZOICA DINU, KEVIN DALY[2], West Virginia University — Technology has emulated, and in many cases improved upon, most of the human senses. However, the chemical senses have historically been overlooked. Molecular recognition elements (MREs) such as aptamers have been available for years, but a key challenge in chemical sensing is the transduction of this molecular binding event into a measurable signal. Here, we demonstrate the use of a ZnO thin film field effect transistor (TFFT) as a suitable platform for transduction. ZnO TFFTs were fabricated with a back-gate configuration on Si/SiO2 substrates using RF magnetron sputtering. TFFTs were bio-functionalized with DNA aptamers using ethoxysilane-based conjugation chemistry. The transfer properties of the TFFTs were used as a proxy for the change in surface properties caused by the aptamer binding event. The functionalized TFFTs showed a decrease in current after exposure to the target analyte (adenosine triphosphate, ATP). Subsequent exposures to increasing concentrations of ATP were accompanied by further decreases in current. Based on the preliminary results, these TFFTs provide a sensitive and durable platform for reporting molecular binding events.

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