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Remote Sensors Incorporating Nanomaterials with Enzyme-Mimetic Properties.

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The need for field portable devices that could respond to the today's requirements for low cost and rapid detection with on-site measurement capabilities is growing. This presentation will discuss development, characterization and deployment of reagentless sensors that utilize nanomaterials with enzyme-like properties and their use as analytical probes for bioanalysis. A unique feature of these devices is the built-in detection mechanism with all the sensing components needed for analysis affixed within the sensing platform. The sensors have been fabricated using automatic 2D and 3D printing procedures, and have been interfaced with user-friendly signal transduction methods. Work focusing on the development of nanoparticle-based tests for point-of-care diagnosis, wearable technology for personal monitoring of disease biomarkers and low-cost sensors for measuring exposure to environmental pollutants will be discussed, with examples of applications. These sensors are easy-to-use, robust and cost effective and do not require labeled reagents, secondary enzymes or soluble dyes. The designed method, utilizing enzyme-like inorganic nanostructures, as a replacement to natural enzymes can eliminate multistep procedures and minimize problems associated with the poor stability of substrates and enzyme labels of conventional assays. Challenges and opportunities for real sample analysis, including matrix effect, sample preparation (or integration with sampling units) and data analysis will be discussed.