
Miniaturized Bioanalytical Sensors

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Abstract

Healthcare issues are keeping increased substantially in recent years. Such research and investment have focused on fighting major diseases, enabled by the novel invention of cost-effective and efficient drug development for treatment and side effect reduction, along with the improved vector control. Moreover, the demand for diagnostics that are essential in determining prognosis, monitoring treatment, identifying disease stages, and assessing the spreading as health services have expanded. However, classic diagnostic technologies are not completely suited to meet the expanded testing requirement because they rely on complicated sample purification and sophisticated instruments which are complicated, time-consuming, expensive and requirement of well-trained technicians. One of the major challenges for the industry is to develop fast, relatively accurate, easy-to-use, and inexpensive devices. In addition to the improved efficiency in laboratory diagnostics, there has been a trend towards a more decentralized diagnostics which occurs directly at patients' bedside, in outpatient clinics or at sites of accidents, so-called point-of-care (POC) systems. The concept of POC testing is mainly by the patient, so short turnaround time, minimum sample preparation, long-term reagent storage, user-friendly analytical instruments and visible quantitative or semi-quantitative single readout is crucial. In order to meet the requirement, we address the need using silicon, polymer and paper-based analytical platforms. They have been developed for biomedical sensing and analysis in resource-limited settings based on their advantages of low sample volume requirement, rapid detection, cost-effectiveness, portable and highly integrated. Moreover, different sensing components, including device fabrication, surface chemistry, signal amplification and biomolecular recognition are also investigated to discern the potential use of more sensitive and selective medical diagnostics.

Keywords: Biochemical sensor, point of care test, lab on a chip system

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