

Graphene Protein Microfluidic FET Sensors

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Chronic diseases are becoming more prevalent, and the complexities of managing patients continue to escalate since their care must be balanced between the home and the clinical settings. Diabetes is the most advanced example where self-monitoring has been shown to be necessary. Glucometers are point-of-care (POC) devices that have become standard at home and clinical settings. Similarly, many other POC biosensors have also been developed. Enzymes are often used in these sensors because of their specificity and the reaction products can be electrochemically transduced for the measurement. When enzymes are immobilized to an electronically active substrate, the enzymatic reactions can be transduced by direct electron transport. This paper describes an approach for the development of graphene-based POC devices. This includes modifying enzymes for improved performance, developing methods to bind them to the graphene surface, incorporation of the functionalized graphene on a field-effect transistor (FET), and integration into a microfluidic device suitable for home use. This paper describes an approach for the development of a graphene-based POC biosensor platform using glucose as an example of target molecule. We are also focusing on micro RNA, triglycerides, ammonia in

plasma. The sensitivity levels observed confirm that the analytes of blood can be detected upto picomolar levels.