Development of graphene based immunosensor for highly sensitive biosensing of water borne pathogens

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Graphene, due to its unique nature have garnered great interest in recent years. One of its derivative such as Graphene oxide(GO) holds great importance in electrochemical applications due to its high surface area, unique electrochemical properties and in improving the sensitivity[i]. Electron transfer between graphene and redox species opens great opportunities in sensing applications. Graphene Oxide comprises of a single layer of graphite oxide. Presence of functional groups on GO serve as a great site for modification and functionalization of GO which can be directly used for various electroactive composites for the design of sensitive and selective electrochemical immunosensor.

The present research work reports the assembly of thin films of amino-functionalized GO on a suitable substrate. Due to the presence of GO, they can be used as an excellent electrode material. The conducting thin film functionalized platform was then comprehensively characterized with various analytical techniques, such as FT-IR and UV-visible spectroscopy, X-Ray Diffraction analysis, Electron microscopy, Surface area analyser etc. Subsequently, the obtained films were bio-interfaced with anti-*S. aureus* antibody to develop a novel immunosensing platforms for the detection of water borne pathogens. Using the electrochemical impedance spectroscopy (EIS) technique of signal measurement, the above MOF based electrochemical sensors were able to detect very low concentrations of *S. aureus* and (2x 10^2 cfu/mL) in both synthetic as well as in real spiked samples The above sensor systems could rapidly monitor the presence of *S. aureus* with a response time of around 2 minutes and also provided selective analysis even in the co-presence of some interfering species, e.g. *S.arlettae* and *S.lentus.*

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[i] Chen, D., Feng, H., & Li, J. (2012). Graphene oxide: preparation, functionalization, and electrochemical applications. *Chemical reviews*, *112*(11), 6027-6053.