

Detection of Heavy Metals with Fluorescent Biosensors

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Graphene oxide (GO) has been demonstrated as both a “turn-off” and a “turn-on” fluorescent biosensor with the capability of detecting trace metal ions.

In the “turn-off” sensing platform, the GO sheets are first functionalized with the ssDNA aptamer. At the excitation of 488 nm laser, the aptamer-GO manifests strong fluorescent emission at 600 nm. However, in the presence of Hg^{2+} , the fluorescent emission is quenched because of the formation of the thymine- Hg^{2+} -thymine complex, which brings Hg^{2+} in close proximity to the GO sheets, facilitating the electron transfer from the GO sheets to the Hg^{2+} ions.

In the “turn-on” sensing platform, the ssDNA aptamer functionalized CdSe/ZnS quantum dots (QDs) are mixed with the GO sheets in the aqueous solution. Thus the GO/aptamer-QD ensemble is formed due to the π - π stacking interactions between the aptamer and the GO sheets. In this case, energy transfer takes place from the QDs to the GO sheets, which leads to quenching of the fluorescent emission of the QDs. When Pb^{2+} is added to the aqueous solution, the fluorescent emission gets recovered as the QDs are detached from the GO/aptamer-QD ensemble due to the formation of the G-quadruplex/ Pb^{2+} complex.

References:

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