**The fluorescence quenching ability of graphene oxide as a platform for pathogenic double-stranded DNA sensing utilizing engineered zinc finger protein.**

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**ABSTRACT:**

Two-dimensional graphene oxide (GO) possesses unique electronic, thermal, and mechanical properties. The quenching ability of GO creates novel methods for detection of biomolecules. A zinc finger is a DNA-binding domain that can recognize three nucleotides. Multiple fingers can be linked together to form zinc finger proteins (ZFPs) that recognize extended DNA sequences. Fluorescence dye-labeled ZFPs can bind to GO via stacking interactions of aromatic and hydrophobic residues in conjunction with hydrogen bonding interaction between hydroxyl or carboxyl groups of GO and hydroxyl or amine groups of the proteins. They can come in close proximity with GO, which acts as a quencher due to fluorescence resonance energy transfer (FRET). Thus, in the absence of target DNA, fluorescence signal of dye-labeled ZFP is quenched. When target DNA binds to ZFPs, the bound complex is released from GO, which causes the fluorescence signal to be restored. Here, fluorescence quenching of dye-labeled ZFP by GO has enabled an effective system with high sensitivity and specificity for the detection of pathogenic dsDNA.