

### Colorimetric detection of target cancer cells utilizing superior catalytic activity of graphene oxide-magnetic-platinum nanohybrids

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Enzyme-linked immunosorbent assays (ELISAs) have most widely been applied in immunoassays for several decades. However, several unavoidable limitations (e.g., instability caused by structural unfolding) of natural enzymes have hindered their widespread applications. Here, we describe a new nanohybrid consisting of Fe<sub>3</sub>O<sub>4</sub> magnetic nanoparticles (MNPs) and platinum nanoparticles (Pt NPs), simultaneously immobilized on the surface of graphene oxide (GO). By synergistically integrating highly catalytically active Pt NPs and MNPs on GO whose frameworks possess high substrate affinity, the nanohybrid is able to achieve up to a 30-fold higher maximal reaction velocity ( $V_{max}$ ) compared to that of free GO for the colorimetric reaction of the peroxidase substrate, 3,3',5,5'-tetramethylbenzidine (TMB), and enable rapid detection of target cancer cells. Specifically, using this new assay system, clinically important breast cancer cells are detected in a 5 min time period at room temperature with high specificity and sensitivity.