

A highly efficient colorimetric immunoassay using a nanocomposite entrapping magnetic and platinum nanoparticles in carbon nanomaterials

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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 Fe₃O₄ magnetic nanoparticles (MNPs) and platinum nanoparticles (Pt NPs), simultaneously immobilized on the surface of graphene oxide (GO) and ordered mesoporous carbon. By synergistically integrating highly catalytically active Pt NPs and MNPs on the nanohybrid is able to achieve significantly enhanced maximal reaction velocity (V_{max}) 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.