Graphene based peroxidase mimicking nanozyme for sensitive and selective bioassays

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To replace the natural enzyme, a lot of nanomaterials mimicking enzyme have been widely studied. Graphene, carbon-based 2D material, was also known to have peroxidase-like activity, however, because of the low catalytic activity, it was hard to replace the natural peroxidase. To selectively improve the peroxidase-like activity of graphene nanosheets, N and B was co-doped into the graphene nanosheets (NB-rGO) and increased the peroxidase-like activity up to 1000 times without oxidase-like activity. Density functional theory (DFT) was applied to understand the superior catalytic activity with selectivity. Finally, the NB-rGO was used applied to detect the acetylcholine and C-reactive protein and successfully detect the target materials more precisely than natural peroxidase.