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An ultrasensitive electrochemical detection of protein molecules via nanoparticle-electrode collisions

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The detection of single molecules has attracted tremendous attention in the past three decades. Single molecular measurements can probe the fundamentals of electron-transfer reactions and address behaviors and processes that cannot be delineated from studies of large ensembles of molecules as traditionally performed. We describe a new electrochemical detection approach towards single protein molecules (microperoxidase-11, MP-11), which are attached on the surface of graphene nanosheets. The non-covalently functionalized graphene nanosheets exhibit enhanced electroactive surface area, where amplified redox current is produced when graphene nanosheets collide with the electrode. The approach provides a novel platform to fabricate a biosensor using the nano-graphene. Thus, it provides a new tool for investigating the individual chemical reactions and properties at the single molecule level.

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