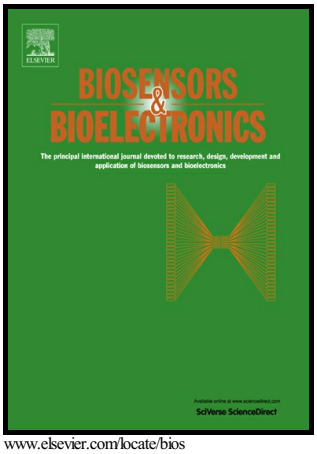

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Simple and rapid chemiluminescence aptasensor for Hg^{2+} in contaminated samples: A new signal amplification mechanism

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Abstract

Detection of ultralow concentration of heavy metal ion Hg^{2+} is important for human health protection and environment monitoring because of the gradual accumulation in environmental and biological fields. Herein, we report a convenient chemiluminescence (CL) biosensing platform for ultrasensitive Hg^{2+} detection by signal amplification mechanism from positively charged gold nanoparticles ((+)AuNPs). It is based on (+)AuNPs charge effect and aptamer conformation change induced by target to stimulate the generation of CL in the presence of H_2O_2 and luminol without high salt medium. Notably particularly, the typical problem of the high salt medium from (-) AuNPs system, like influencing aptamers' bind with target and hindering CL reaction can be effectively addressed through the direct introduction of (+) AuNPs. Therefore, the proposed biosensing exhibits a high sensitivity toward target Hg^{2+} with a detection limit of 16 pM, which is far below the limit (10 nM) defined by the U.S. Environmental Protection Agency in drinkable water, and is about 10-fold lower than the previously reported aptamer-based assays for Hg^{2+}. This sensing platform provides a simple, rapid, and cost-effective approach for label-free sensitive detection of Hg^{2+}. Moreover, it is universal for the detection of other targets. Undoubtedly, such a direct utilizing of (+)AuNPs' charge effect will provide a new signal amplification way for label-free aptamer-based CL analysis.