

Dual fluorogenic nanoparticles for sensitive and specific detection of Pb²⁺ and Hg²⁺

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Detection of heavy metal ions in aqueous system including human blood plasma is an important issue because of their adverse effects on human health and the environments. Among them, Pb²⁺, and Hg²⁺ are the major elements requiring a critical caution because of the severe health effects. While various detection methods have been developed, the heavy metal specific oligonucleotides such as metal dependent DNAzyme and Hg²⁺ aptamers have improved the detection sensitivity and specificity significantly. However, further improvement for the detecting sensitivity and feasibility are still open. Specially, no scheme is reported to detect Pb²⁺ and Hg²⁺ simultaneously. For the dual detection, a fluorescence signal change is more suitable rather than color change in the presence of the metal ions. Therefore, we devised a scheme to generate fluorescence signal combining the DNAzyme and aptamer on gold nanoparticles which act as a super quencher for two different fluorophores. In the presence of the metal ions, the fluorescence signal can be turned on because of the enzymatic cleavages of the substrate by DNAzymes for Pb²⁺ and the conformational change for Hg²⁺ whereas the nanoparticles are in latent in the absence of the metal ions.