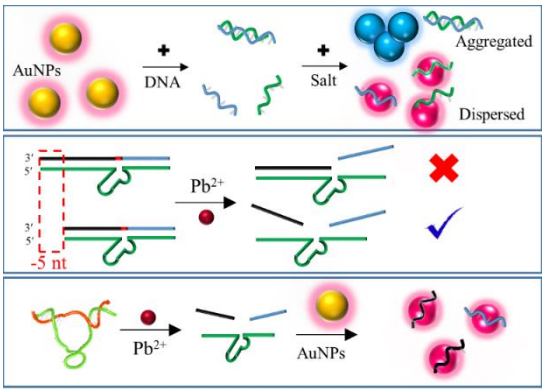
Colorimetric label-free nanosensor for improved sensitive lead detection in water utilizing unmodified AuNP: Insight into rational design of Pb^{2+}zyme

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Abstract (300 word limit)

Water pollution accidents caused by the lead contamination, such as Flint water crisis in the United States, strongly pushed the public to concern the safety of the drinking water distribution system. As a prerequisite, the routine monitoring of lead in water is highly required and demands for an efficient, sensitive, cost-effective, and reliable lead detection methods. This study reports a label-free colorimetric nanosensor using unmodified gold nanoparticles (AuNPs) as indicators to enable rapid and ultra-sensitive detection of lead in environmental water. The 8-17 DNAzyme was truncated in this study to facilitate the detachment of ssDNA fragments after the substrate cleavage upon Pb^{2+} presence. The detached fragments got adsorbed over AuNPs and protected their aggregation against induced salt concentration. As expected, more Pb^{2+} would result in a stronger color change from blue to pink. The established sensing principle achieved a sensitive limit of detection (LOD) of Pb^{2+} as 0.2 nM with a linear working range of two orders of magnitude from 0.5 nM to 5.0 nM. The selectivity of nanosensor was demonstrated by evaluating against interfering metal ions. The developed nanosensor can serve as a substitute for rapid analysis and monitoring trace lead levels under the drinking water distribution system and even other environmental water samples.

Graphical abstract



Recent Publications (minimum 5) [1]–[5]

[1] W. Sun, L. Liu, A. G. Memon, X. Zhou, and H. Zhao, "Waveguide-Based Fluorescent Immunosensor for the Simultaneous Detection of Carbofuran and 3-Hydroxy-Carbofuran," *Biosensors*, vol. 10, no. 12, p. 191, Nov. 2020.

[2] A. G. Memon *et al.*, "Ultrasensitive colorimetric aptasensor for Hg2+ detection using Exo-III assisted target recycling amplification and unmodified AuNPs as indicators," *J. Hazard. Mater.*, p. 120948, Aug. 2019.

[3] A. G. Memon *et al.*, "Label-free colorimetric nanosensor with improved sensitivity for Pb2 + in water by using a truncated 8–17 DNAzyme," *Front. Environ. Sci. Eng.*, vol. 13, no. 1, p. 12, Feb. 2019.

[4] A. G. Memon *et al.*, "Utilization of unmodified gold nanoparticles for label-free detection of mercury (II): Insight into rational design of mercury-specific oligonucleotides," *J. Hazard. Mater.*, vol. 321, 2017.

[5] R. Wang, X. Zhou, B. Liedberg, X. Zhu, A. G. Memon, and H. Shi, "Screening Criteria for Qualified Antibiotic Targets in Unmodified Gold Nanoparticles-Based Aptasensing," *ACS Appl. Mater. Interfaces*, vol. 9, no. 40, 2017.



Biography (150 word limit)

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Notes/Comments