# A Graphene Nanoplatelet-Polydopamine Molecularly Imprinted Biosensor for Ultratrace Creatinine Detection

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## Abstract

Accurate and reliable analysis of creatinine is clinically important for the early detection and monitoring of patients with kidney disease. [1] We report a novel graphene nanoplatelet (GNP)/polydopamine (PDA)-molecularly imprinted polymer (MIP) biosensor for the ultra-trace detection of creatinine in a range of body fluids. Dopamine hydrochloride (DA) monomers were polymerized using a simple one-pot method to form a thin PDA-MIP layer on the surface of GNP with high density of creatinine recognition sites. This novel surface-MIP strategy resulted in a record low limit-of-detection (LOD) of $2 \times 10^{-2}$ pg/ml with a wide dynamic detection range between $1 \times 10^{-1}$-$1 \times 10^{9}$ pg/ml. The practical application of this GNP/PDA-MIP biosensor has been tested by measuring creatinine in human serum, urine, and peritoneal dialysis (PD) fluids. The average recovery rate was 93.7–109.2% with relative standard deviation (RSD) below 4.1% compared to measurements made using standard clinical laboratory methods. Our GNP/PDA-MIP biosensor holds high promise for further development as a rapid, accurate, point-of-care diagnostic platform for detecting and monitoring patients with kidney disease. [2]

## References

[1] Y.Y. Broza, X. Zhou, M. Yuan, D. Qu, Y. Zheng, R. Vishinkin, M. Khatib, W. Wu, H. Haick, Chem. Rev., 119 (22) (2019), pp. 11761-11817
[2] Y. Li, L. Luo, M. Nie, A. Davenport, Y. Li, B. Li, K.L. Choy, Biosensors and Bioelectronics, 216 (2022), p.114638.

## Figures

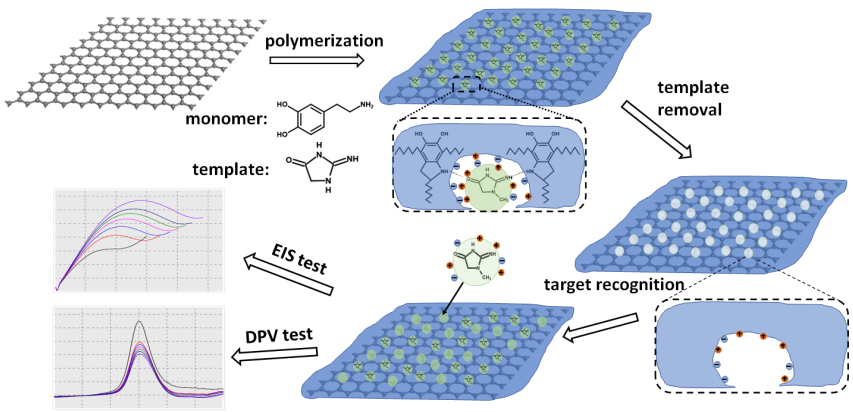


**Figure 1:** Schematic representation for the fabrication and application process of GNP/PDA-MIP.