Magneto-catalytic graphene quantum dots Janus micromotors for bacterial endotoxin detection

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Magneto-catalytic hybrid Janus micromotors encapsulating phenylboronic acid (PABA) graphene quantum dots (GQDs) are used here as ultrafast sensors for detection of deadly bacteria endotoxins. A bottom-up approach is adopted to synthetize an oil-in-water emulsion containing the GQDs along with a high loading of platinum and iron oxide nanoparticles on one side of the Janus micromotor body. The two different "active regions" allow for highly efficient propulsion in the presence of peroxide solutions or magnetic actuation. Fluorescence quenching is observed upon GQDs interaction with the target endotoxin (LPS), with the PABA tags acting as highly specific recognition receptors of the LPS-core polysaccharide region. Such adaptive hybrid operation and highly specific detection hold considerable promise towards diverse clinical, agro-food and biological applications with clear promising to integrate in future lab-on-chip technology.

References

[1] B. Jurado-Sánchez, M. Pacheco, J. Rojo, A. Escarpa. Angewandte Chemie International Edition (2017), 56, 6957-6961 [DOI:10.1002/anie.201701396R2]

Figures

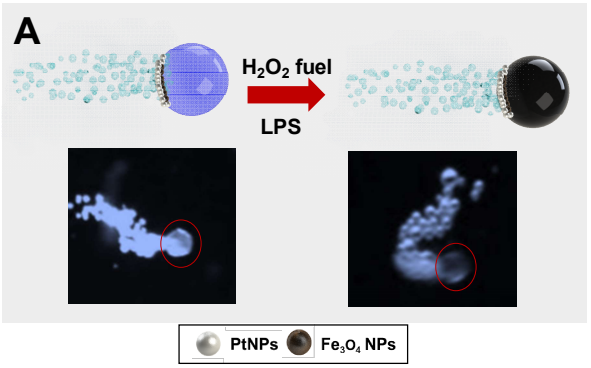

Figure 1: *Bubble-propulsion and optical microscopy images of the Janus micromotors before and after LPS addition. (B) Optical microscopy images of the magnetotactic behaviour the Janus during its navigation in the different channels of a PDMS chip. Scale bars, 20 μm.*