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Self-assembling Phage-Quantum Dot Nanocomplexes for Quantitative Biodetection MATTHEW CLARKE, HYEONGGON KANG, JEESEONG HWANG, National Institute of Standards and Technology — Colloidal quantum dots (QDs) have been used for many biodetection applications because of their brightness and broad spectral coverage in multiplexed approaches. QD surfaces can be functionalized for bio-conjugation to enable self-assembly with other nanomaterials and biomolecules using biological or bio-inspired processes. We demonstrate a model bacterial detection system using phage-QD nanocomplexes. To engineer the nanocomplexes, we genetically modified phage to express lysine residues on the capsid region, resulting in biotin labeling during replication inside the host cell. The biotinylated phages were conjugated with QDs and employed for detection. Bacteriophages have specificity to bacteria, enabling targeted detection of specific strains. Brightness of QDs enables high-throughput optical detection. The properties of nanocomplexes and detection limit/sensitivity were quantitatively evaluated using integrated differential interference contrast and fluorescence microscopy and automated image-based cytometry technique.

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