Toward Point-of-care Diagnostics: Consistent Colorimetric Biosensing with Plasmonic Nanoparticles

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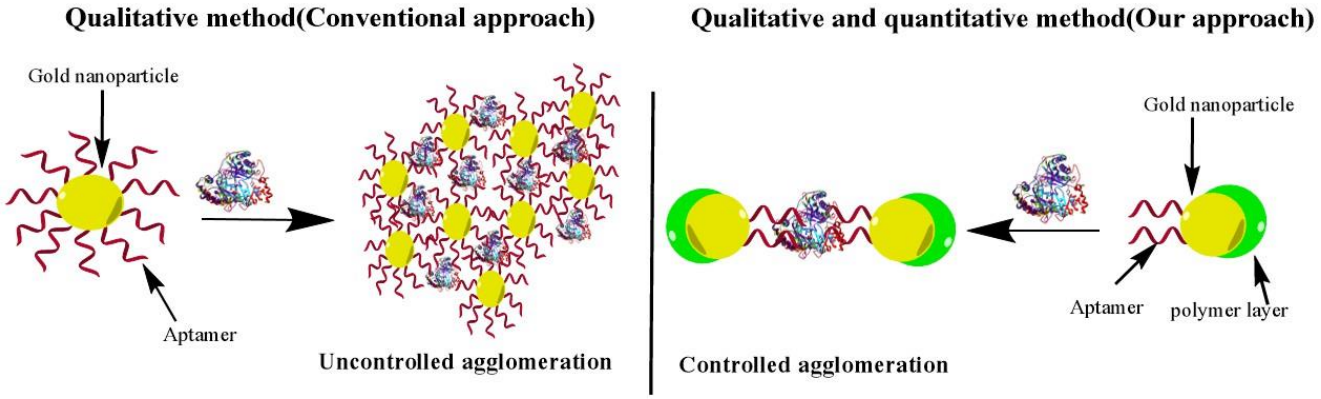
The rapid detection of clinically relevant analyte targets is essential for point-of-action diagnostics and in environments lacking laboratory infrastructure. Colorimetric biosensors based on plasmonic nanoparticles (NPs) in particular can provide an adequate solution to this demand.[1] Such plasmonic nanoparticles, e.g. the most commonly used gold nanoparticles, feature unique optical properties due to their localized surface plasmon resonance in visible frequencies. Analyte-induce agglomeration of plasmonic nanoparticles in solution can be accompanied by a pronounced color change, which can serve as an optical read-out for analyte detection. However, conventional detection approaches based on this concept allow target analyte detection only semi-quantitatively, which is due to uncontrolled nature of the underlying NP agglomeration process.[2]
In this contribution, strategies for improving the consistency of the described agglomeration-based colorimetric (bio-)analyte detection method are presented. The use of janus-like aptamer-functionalized gold NPs allowed to control the location of aptamer attachment on their surface, which in turn enabled the controlled formation of programmed, finite-sized NP assemblies.[3] This programmed assembly results in a regular change in LSP proportional with the concentration of the target biomolecule that can be tracked consistently.



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