

[0016] In a first aspect, there is provided a biomolecule complex for the detection and/or quantitation of an analyte in a sample, comprising:

an anchor strand attached to a support;

a capture reagent attached to the support; and

a detection reagent releasably attached to the anchor strand, the detection reagent or the anchor strand being optionally attached to a first label, the first label being inactive or undetectable;

wherein: the capture reagent and the detection reagent can simultaneously bind to the analyte, if present in the sample, forming a tertiary complex; release of the detection reagent from the anchor strand can release the detection reagent from the support in the absence of the analyte; and the first label can be activated or detected when the detection reagent is released from the anchor strand. The presence of the analyte in the sample is thus determined through detection of the first label on the support after the detection reagent has been released from the anchor strand, since the detection reagent will only remain attached to the support if bound to the analyte in a tertiary complex with the capture reagent. In some embodiments, therefore, the first label is only detected on the support when the analyte is present.

[0016a] In one aspect, there is provided biomolecule complex for the detection or quantification of an analyte in a sample, comprising:

(a) a support complex comprising:

(i) a support;

(ii) a capture reagent coupled with the support;

(iii) an anchor oligonucleotide coupled with the support;

(iv) a detection reagent coupled with a hook oligonucleotide, wherein the hook oligonucleotide is releasably coupled with the anchor oligonucleotide at a coupled region; and

(b) a detectably-labeled displacer oligonucleotide configured to bind to the hook

oligonucleotide and release the hook oligonucleotide from the anchor oligonucleotide;

wherein the capture reagent and the detection reagent are configured to simultaneously couple with the analyte.

[0017] In some embodiments, the amount of the first label on the support, or detected on the support, when the detection reagent is released from the anchor strand is proportional to the quantity and/or concentration of the analyte in the sample.

[0018] In some embodiments, the detection reagent or the anchor strand is optionally attached to the first label. In some embodiments, the detection reagent is optionally attached to the first label. In some embodiments, the anchor strand is optionally attached to the first label.

[0019] In some embodiments, the detection reagent is releasably attached to the anchor strand directly via a covalent bond, a biotin-streptavidin bond, hydrogen bonding, a hydrophobic interaction, affinity binding, or a non-covalent interaction.

[0020] In other embodiments, the detection reagent is attached to the anchor strand indirectly via a hook strand, the detection reagent being linked to the hook strand and the hook strand being releasably attached to the anchor strand, wherein release of the hook strand from the anchor strand can release the detection reagent

CLAIMS

What is claimed is:

1. A biomolecule complex for the detection or quantification of an analyte in a sample, comprising:

(a) a support complex comprising:

(i) a support;

(ii) a capture reagent coupled with the support;

(iii) an anchor oligonucleotide coupled with the support;

(iv) a detection reagent coupled with a hook oligonucleotide, wherein the hook oligonucleotide is releasably coupled with the anchor oligonucleotide at a coupled region; and

(b) a detectably-labeled displacer oligonucleotide configured to bind to the hook oligonucleotide and release the hook oligonucleotide from the anchor oligonucleotide;

wherein the capture reagent and the detection reagent are configured to simultaneously couple with the analyte.

2. The biomolecule complex of claim 1, wherein the support complex further comprises the detectably-labeled displacer oligonucleotide when (i) the detectably-labeled displacer reagent is bound to the hook oligonucleotide, and (ii) the analyte is coupled to the capture reagent and the detection reagent.

3. The biomolecule complex of claim 1, further wherein the support complex does not comprise the detectably-labeled displacer oligonucleotide when (i) the detectably-labeled displacer reagent is coupled to the hook oligonucleotide, and (ii) the analyte is not coupled to one or both of the capture reagent and detection reagent.

4. The biomolecule complex of claim 1, wherein the analyte is an antigen, an antibody, an affimer, an aptamer, a modified aptamer, a somamer, an antibody fragment, a protein, a polypeptide, a multi-protein complex, an exosome, an oligonucleotide, a hormone, a modified oligonucleotide, or a low molecular weight compound.

5. The biomolecule complex of claim 1, wherein the anchor oligonucleotide comprises an anchor sequence and the hook oligonucleotide comprises a linker sequence complementary to the anchor sequence.

6. The biomolecule complex of claim 6, wherein the hook oligonucleotide comprises an additional sequence adjacent to the linker sequence and the detectably-labeled displacer oligonucleotide comprises a displacer sequence complementary to the additional sequence and at least a portion of the linker sequence.
7. The biomolecule complex of claim 6, wherein the displacer sequence is complementary to the linker sequence.
8. The biomolecule complex of claim 6, wherein the additional sequence comprises at least one nucleotide.
9. The biomolecule complex of claim 6, wherein the displacer sequence has a melting temperature greater than that of the anchor sequence.
10. The biomolecule complex of claim 1, wherein the sample is a biological sample.
11. The biomolecule complex of claim 10, wherein the sample is a bodily fluid, a whole blood sample, a cell supernatant, an extract, a cell extract, a cell lysate, a tissue lysate, a solution comprising nucleic acid molecules, or a solution comprising proteins.
12. The biomolecule complex of claim 1, wherein the capture reagent is selected from the group consisting of: an antibody or an antigen-binding fragment thereof, an aptamer, a modified aptamer, a somamer, an affimer, an antigen, a protein, a polypeptide, a multi-protein complex, an exosome, an oligonucleotide, a low molecular weight compound, and any combination thereof.
13. The biomolecule complex of claim 1, wherein the detection reagent is selected from the group consisting of: an antibody or an antigen-binding fragment thereof, an aptamer, a modified aptamer, a somamer, an affimer, an antigen, a protein, a polypeptide, a multi-protein complex, an exosome, an oligonucleotide, a low molecular weight compound, and any combination thereof.
14. The biomolecule complex of claim 1, wherein the capture reagent and the detection reagent are both antibodies or antigen-binding fragments thereof.
15. The biomolecule complex of claim 15, wherein the capture reagent and the detection reagent are a different antibody or antigen-binding fragment thereof and bind to a different epitope on the analyte.
16. The biomolecule complex of claim 1, wherein the detectably-labeled displacer oligonucleotide comprises a detectable label selected from the group consisting of a fluorescent polymer, a biotin molecule, a fluorophore, an enzyme, a nucleic acid enzyme, a riboswitch, an enzyme substrate, a specific nucleic acid sequence, and any combination thereof.

17. The biomolecule complex of claim 1, wherein the support is a microparticle, a nanoparticle, a well in a plate, an array, a microfluidic chip, a lateral flow strip, a slide, a porous polymer, or a hydrogel.
18. The biomolecule complex of claim 1, wherein the support complex comprises a plurality of the capture reagent, a plurality of the anchor oligonucleotide, and a plurality of the detection reagents coupled with the hook oligonucleotide.
19. The biomolecule complex of claim 1, wherein the detection reagent is coupled with a single hook oligonucleotide.
20. A multiplex sandwich assay system for the simultaneous detection and/or quantitation of two or more analytes in a sample, the system comprising two or more biomolecule complexes as defined in any one of claims 1 to 19, wherein each biomolecule complex is for the detection and/or quantitation of a different analyte in the sample.