CLAIMS

1. A supramolecular structure configured to capture and detect an analyte molecule, comprising:

a core structure including a plurality of molecules linked together;

a capture molecule configured to bind with the analyte molecule and linked to the core structure at a first location; and

a detector molecule spaced apart from the capture molecule at a pre-determined distance, configured to bind with the analyte molecule, and linked to the core structure at a second location by forming a linkage with a detector barcode which forms a linkage with the core structure;

wherein the capture molecule and the detector molecule are configured to be simultaneously linked to the analyte molecule;

wherein the detector molecule is configured to be separated from the core structure upon being subjected to a first trigger, thereby remaining linked to the core structure only when linked to the capture molecule through binding with the analyte molecule; and

wherein the detector molecule remains linked to the detector barcode after being subjected to the first trigger.

2. The supramolecular structure of claim 1, wherein the distance between the capture molecule and the detector molecule is between 1nm-60nm.

3. The supramolecular structure of claim 2, wherein the distance between the capture molecule and the detector molecule is between 3nm-40nm.

4. The supramolecular structure of claim 1, wherein the capture molecule is linked to the core structure through a capture barcode including DNA or RNA of a specific sequence.

5. The supramolecular structure of claim 1, wherein the first trigger includes one or more deconstructor molecules.

6. The supramolecular structure of claim 1, wherein the first trigger includes an electrical signal, a microwave signal, ultraviolet illumination, visible illumination or near infra-red illumination.

7. The supramolecular structure of claim 1, wherein the detector barcode includes DNA or RNA of a specific sequence.

8. The supramolecular structure of claim 1, wherein the detector barcode is configured to be cleaved from the detector molecule by a second trigger.

9. The supramolecular structure of claim 8, wherein the second trigger is a detector barcode release molecule.

10. A method for detecting analyte molecules in a sample, comprising:

providing a supramolecular structure including:

a core structure including a plurality of molecules linked together;

a plurality of capture molecules configured to bind with the analyte molecules and each linked to the core structure at respective first locations; and

a plurality of detector molecules each spaced apart from one of the capture molecules by a pre-determined distance, configured to bind with the analyte molecules, and each linked to the core structure by forming a linkage with detector barcodes which form linkages with the core structure at respective second locations ;

wherein each capture molecule and each detector molecule is configured to be simultaneously linked to a respective one of the analyte molecules;

contacting the sample with the supramolecular structure for a time sufficient to allow binding of the capture molecules and the detector molecules with the analyte molecules;

providing a first trigger to cleave the links between the detector molecules and the core structure, wherein the detector molecules remain linked to the detector barcodes after the links between the detector molecules and the core structure are cleaved;

after providing the first trigger, separating detector molecules unbound from the core structure from detector molecules bound to the core structure; and

identifying the analyte molecules by analyzing the detector barcodes of the detector molecules which bound to the core structure after providing the first trigger.

11. The method of claim 10, further comprising providing a second trigger to cleave the links between the detector barcodes and the detector molecules before analyzing the detector barcodes.

12. The method of claim 11, wherein the second trigger is a detector barcode release molecule.

13. The method of claim 11, wherein providing the second trigger is performed after separating detector molecules unbound from the core structure from detector molecules bound to the core structure.

14. The method of claim 11, wherein the second trigger comprises a nucleic acid.

15. The method of claim 14, wherein cleaving the links between the detector barcodes and the detector molecules is accomplished through nucleic acid strand displacement.