WHAT IS CLAIMED IS:

1. A method for generating analyte capture data, the method comprising:

exposing, in a solution, a plurality of supramolecular structures to a sample comprising one or more analytes, wherein the supramolecular structures each comprise one or more affinity binders attached to a core structure;

processing the solution to remove supramolecular structures that have not bound analyte;

deconstructing complexes of the supramolecular structure and analyte present in the solution to release one or more unique identifiers associated with each binding event of analyte to a respective supramolecular structure;

isolating the one or more unique identifiers in the solution;

exposing a surface seeded with a one or more adapter types to the solution comprising the one or more unique identifiers; and

performing a readout operation of the one or more unique identifiers which have interacted with the one or more adapters to generate qualitative or quantitative analyte capture data.

2. The method of claim 1, further comprising incubating the supramolecular structures and the sample in solution.

3. The method of claim 1, wherein the one or more unique identifiers comprise barcode sequences.

4. The method of claim 1, wherein the one or more adapter types comprise one or more primers, wherein at least a subset of the one or more primers are complementary to at least a portion of the one or more unique identifiers.

5. The method of claim 1, wherein the core structure comprises a DNA origami.

6. The method of claim 1, wherein the surface is provided as a portion of a flow cell.

7. The method of claim 1, wherein the affinity binders comprise one or more of a protein, a peptide, an antibody, an aptamer, a fluorophore, a darpin, a catalyst, a polymerization initiator, a polymer, or combinations thereof.

8. A method for generating analyte capture data, the method comprising:

exposing, in a solution, a plurality of supramolecular structures to a sample comprising one or more analytes, wherein the supramolecular structures each comprise one or more affinity binders attached to a core structure;

processing the solution to remove supramolecular structures that have bound analyte;

deconstructing supramolecular structures unbound to analytes and remaining in the solution to release one or more unique identifiers indicative of which analyte or analytes to which the remaining supramolecular structures have an affinity;

isolating the one or more unique identifiers in the solution;

exposing a surface seeded with a one or more adapter types to the solution comprising the one or more unique identifiers; and

performing a readout operation of the one or more unique identifiers which have interacted with the one or more adapters to generate qualitative or quantitative analyte capture data.

9. A substrate comprising a plurality of supramolecular structures, each supramolecular structure comprising:

a core structure comprising a plurality of core molecules;

one or more capture molecules linked to the supramolecular core at a first set of locations;

one or more detector molecules linked to the supramolecular core at a second set of locations; and

one or more barcode sequences linked to the supramolecular core at locations other than the first set of locations and the second set of locations, wherein the one or more barcode sequences identify the core structure, the capture molecules, the detector molecules, or combinations thereof;

wherein one or both of the capture molecules or the detector molecules selectively bind to an analyte of interest.

10. The substrate of claim 9, wherein the barcode sequences comprise nucleic acid sequences.

11. The substrate of claim 9, wherein each core structure of the plurality of supramolecular structures is identical to each other.

12. The substrate of claim 9, wherein the substrate comprises a solid support, solid substrate, a polymer matrix, or a molecular condensate.

13. The substrate of claim 9, wherein the analyte of interest comprises a protein, a peptide, a peptide fragment, a lipid, a DNA, a RNA, an organic molecule, an inorganic molecule, complexes thereof, or any combinations thereof.

14. The substrate of claim 9, wherein each supramolecular structure is a nanostructure.

15. The substrate of claim 9, wherein the plurality of core molecules for each core structure comprises one or more nucleic acid strands, one or more branched nucleic acids, one or more peptides, one or more small molecules, or combinations thereof.

16. The substrate of claim 9, wherein each core structure independently comprises a scaffolded deoxyribonucleic acid (DNA) origami, a scaffolded ribonucleic acid (RNA) origami, a scaffolded hybrid DNA:RNA origami, a single-stranded DNA tile structure, a multi-stranded DNA tile structure, a single-stranded RNA origami, a multi-stranded RNA tile structure, hierarchically composed DNA or RNA origami with multiple scaffolds, a peptide structure, or combinations thereof.

17. The substrate of claim 9, wherein the one or more capture molecules and one or more detector molecules for each supramolecular structure independently comprise a protein, a peptide, an antibody, an aptamer (RNA and DNA), a fluorophore, a darpin, a catalyst, a polymerization initiator, a polymer, or combinations thereof.