CLAIMS

1. A kit for analyzing a macromolecule analyte immobilized on a solid support, comprising:

(a) one or more nucleic acid recording tags configured to associate directly or indirectly with the macromolecule analyte;

(b) one or more binding agents each comprising (i) a binding moiety capable of binding to the macromolecule analyte immobilized on the solid support; and (ii) a nucleic acid coding tag attached to the binding moiety and comprising a barcode sequence that comprises identifying information regarding the binding moiety;

wherein the one or more nucleic acid recording tags and the one or more nucleic acid coding tags are configured to allow transfer of the identifying information regarding the binding moiety by ligation or primer extension between them, upon binding between each binding agent and the macromolecule analyte immobilized on the solid support.

2. The kit of claim 1, further comprising the solid support, wherein the one or more nucleic acid recording tags are configured to be: covalently immobilized directly or indirectly to the solid support; or associated with the macromolecule analyte immobilized on the solid support.

3. The kit of claim 2, wherein the solid support comprises a plurality of DNA hairpins immobilized on the solid support and configured to capture via hybridization the one or more nucleic acid recording tags associated with the macromolecule analyte.

4. The kit of claim 1, comprising two or more different binding agents, wherein each binding agent comprises a nucleic acid coding tag comprising a barcode sequence that comprises identifying information regarding the associated binding moiety.

5. The kit of claim 4, which comprises three or more different binding agents, wherein each binding agent comprises a nucleic acid coding tag comprising a barcode sequence that comprises identifying information regarding the associated binding moiety.

6. The kit of claim 1, further comprising a reagent for transferring the identifying information regarding the binding moiety by ligation or primer extension between the one or more nucleic acid coding tags and the one or more nucleic acid recording tags, upon binding between the one or more binding agents and the macromolecule analyte.

7. The kit of claim 1, wherein the macromolecule analyte comprises a polypeptide, a protein or a polypeptide chain or a fragment thereof, a lipid, a carbohydrate, or a macrocycle, or a combination

or complex thereof.

8. The kit of claim 1, wherein the macromolecule analyte comprises a polypeptide analyte, and the binding moiety of one or more binding agents is capable of binding to one or more N-terminal or C-terminal amino acids of the polypeptide analyte, or capable of binding to the one or more N-terminal or C-terminal amino acids modified by a functionalizing reagent.

9. The kit of claim 8, further comprising the functionalizing reagent capable of modifying an N-terminal amino acid (NTAA) or a C-terminal amino acid (CTAA) of the polypeptide analyte to generate a functionalized NTAA or a functionalized CTAA of the polypeptide analyte.

10. The kit of claim 8, further comprising an eliminating reagent for removing the N-terminal or C-terminal amino acids of the polypeptide, or removing the N-terminal or C-terminal amino acids modified by the functionalizing reagent.

11. The kit of claim 9, further comprising an eliminating reagent for removing the N-terminal or C-terminal amino acids of the polypeptide, or removing the N-terminal or C-terminal amino acids modified by the functionalizing reagent.

12. The kit of claim 1, further comprising an instruction for using the kit in high throughput macromolecule analysis.

13. The kit of claim 1, wherein the kit is for analysis of a plurality of macromolecule analytes immobilized on the solid support, and the kit comprises a plurality of binding agents, wherein each binding agent comprises (i) a binding moiety capable of binding to one or more macromolecule analyte(s) from the plurality of macromolecule analytes immobilized on the solid support; and (ii) a nucleic acid coding tag attached to the binding moiety and comprising a barcode sequence that comprises identifying information regarding the binding moiety, wherein the nucleic acid coding tags and the one or more nucleic acid recording tags are configured to allow transfer of the identifying information regarding the binding moiety by ligation or primer extension between them, upon binding between each binding agent from the plurality of binding agents and the one or more macromolecule analyte(s) immobilized on the solid support.

14. A kit for analyzing a polypeptide analyte immobilized on a solid support, comprising:

(a) a functionalizing reagent capable of modifying an N-terminal amino acid (NTAA) of the polypeptide analyte to generate a functionalized NTAA of the polypeptide analyte;

(b) one or more binding agents each comprising (i) a binding moiety capable of binding to the functionalized NTAA of the polypeptide analyte immobilized on the solid support; and (ii) a

nucleic acid coding tag attached to the binding moiety and comprising a barcode sequence that comprises identifying information regarding the binding moiety; and

(c) one or more nucleic acid recording tags configured to associate directly or indirectly with the polypeptide analyte,

wherein the one or more nucleic acid recording tags and the one or more nucleic acid coding tags are configured to allow transfer of the identifying information regarding the binding moiety by ligation or primer extension between them, upon binding between each binding agent and the polypeptide analyte immobilized on the solid support.

15. The kit of claim 14, further comprising an eliminating reagent for removing the functionalized NTAA to expose the immediately adjacent amino acid residue, as a second NTAA.

16. The kit of claim 14, comprising three or more different binding agents, wherein each binding agent comprises a nucleic acid coding tag comprising a barcode sequence that comprises identifying information regarding the associated binding moiety.

17. The kit of claim 14, further comprising at least one binding agent that binds to a post-translational modification of the polypeptide.

18. The kit of claim 14, comprising 20 or more different binding agents, wherein each binding agent comprises a nucleic acid coding tag comprising a barcode sequence that comprises identifying information regarding the associated binding moiety.

19. The kit of claim 18, wherein the two or more binding agents from the 20 or more different binding agents have the same binding moiety and have different binding cycle specific sequences located in the nucleic acid coding tag.

20. The kit of claim 14, further comprising an instruction for using the kit in high throughput polypeptide analysis.

21. The kit of claim 14, further comprising the solid support, wherein the one or more nucleic acid recording tags are configured to be: covalently immobilized to the solid support, directly or indirectly; or associated with the polypeptide analyte immobilized on the solid support.

22. The kit of claim 14, further comprising a reagent for transferring the identifying information regarding the binding moiety by ligation or primer extension between the one or more nucleic acid coding tags and the one or more nucleic acid recording tags.

23. The kit of claim 21, wherein the solid support comprises a plurality of DNA hairpins immobilized on the solid support and configured to capture via hybridization the one or more nucleic acid recording tags associated with the polypeptide analyte.