Claims

1. A method for identifying a nucleic acid binding site of a target, the method comprising:

(a) contacting the target that is bound to the nucleic acid binding site with a tagging composition, thereby binding the tagging composition to the target, wherein the tagging composition comprises:

(i) an antibody or an antibody fragment that binds to the target;

(ii) a heterocyclic compound that is linked to the antibody or the antibody fragment;

(iii) a protein complex; and

(iv) two or more nucleic acids that each comprise a barcode nucleotide sequence, wherein the two or more nucleic acids are linked to the heterocyclic compound; and

(b) contacting the two or more nucleic acids of the tagging composition with a transposase, thereby forming an antibody-barcode-transposase complex, wherein the antibody-barcode-transposase complex generates double stranded breaks in a nucleic acid comprising the nucleic acid binding site to generate a nucleic acid fragment comprising the nucleic acid binding site;

(c) isolating the nucleic acid fragment; and

(d) sequencing the nucleic acid fragment, thereby identifying the nucleic acid binding site of the target.

2. The method of claim 1, wherein the protein complex comprises avidin, streptavidin, or neutravidin; and/or wherein the heterocyclic compound comprises biotin.

3. The method of claim 1 or 2, wherein the transposase comprises a Tn5 transposase.

4. The method of any one of claims 1 to 3, wherein each of the two or more nucleic acids further comprise a transposase mosaic sequence that binds to the transposase, optionally wherein the transposase mosaic sequence binds to a Tn5 transposase.

5. The method of any one of claims 1 to 4, wherein the target comprises a DNA-binding protein, optionally wherein the DNA-binding protein comprises a transcription factor, a

regulatory element, a transcriptional repressor, a transcriptional activator, a polymerase, a nuclease, a nickase, a zinc finger protein, a transcription activator-like effector nuclease (TALEN), a glycosylase, a methylase, a ligase, a restriction enzyme, a replication protein, a helicase, or a kinase.

6. The method of any one of claims 1 to 5, wherein the antibody or the antibody fragment is not directly linked to the two or more nucleic acids.

7. The method of any one of claims 1 to 6, wherein the protein complex binds to the heterocyclic compound linked to the antibody or the antibody fragment and binds to the heterocyclic compound that is linked to the two or more nucleic acids.

8. The method of any one of claims 1 to 7, wherein the method further comprises adding magnesium to a sample comprising the target and the tagging composition.

9. The method of any one of claims 1 to 8, wherein the two or more nucleic acids each further comprise an amplification handle.

10. The method of any one of claims 1 to 9, wherein the method further comprises amplifying the nucleic acid fragment to provide a sequencing library.

11. A composition comprising:

(a) one or more antibodies or antibody fragments that bind to a target;

(b) heterocyclic compounds linked to the one or more antibodies or antibody fragments;

(c) protein complexes comprising avidin, streptavidin, or neutravidin; and

(d) two or more nucleic acids that each comprise:

(i) a barcode nucleotide sequence; and

(ii) a transposase mosaic sequence,

wherein the two or more nucleic acids are linked to heterocyclic compounds, and wherein the composition forms a complex in solution.

12. The composition of claim 11, wherein the protein complex comprises streptavidin; wherein the heterocyclic compound comprises biotin; and/or wherein the transposase comprises a Tn5 transposase.

13. The composition of claim 11 or 12, wherein the antibody or antibody fragment comprises a region that binds to a DNA-binding protein, optionally wherein the DNA-binding protein comprises a transcription factor, a regulatory element, a transcriptional repressor, a transcriptional activator, a polymerase, a nuclease, a nickase, a zinc finger protein, a transcription activator-like effector nuclease (TALEN), a glycosylase, a methylase, a ligase, a restriction enzyme, a replication protein, a helicase, or a kinase.

14. The composition of any one of claims 11 to 13, wherein the protein complexes bind to the heterocyclic compounds.

15. A kit comprising:

a first container comprising the composition of claim 11; and

a second container comprising a transposase;

optionally further comprising reagents for tagmentation and/or reagents and materials for isolating DNA and amplifying a nucleic acid; and/or optionally further comprising a cell capture scaffold, wherein the cell capture scaffold comprises a magnetic bead, a column, a concanavalin A bead, a streptavidin bead, a colloidal semiconductor nanocrystal, a carbon nanotube, or a microfluidic device.