CLAIMS

1. A method for determining interaction of a polypeptide with a potential binding partner, the method comprising

a) providing a mixture comprising the polypeptide, the potential binding partner, and metallic nanoparticles carrying a negative charge at a surface of each of the nanoparticles;

b) subjecting the mixture to ~~at least one of (i) an electrolyte and (ii)~~ temperature increase and optionally an electrolyte; and

c) determining the interaction of the polypeptide with the potential binding partner by determining degree of aggregation of the metallic nanoparticles.

2. The method of claim 1, wherein step a) comprises contacting the polypeptide with the potential binding partner, and subsequently contacting the resulting mixture with the metallic nanoparticles.

3. The method of claim 1, wherein step a) comprises contacting the polypeptide with the metallic nanoparticles, and subsequently contacting the resulting mixture with the potential binding partner.

4. The method of claim 1, wherein step a) comprises contacting the potential binding partner with the metallic nanoparticles, and subsequently contacting the resulting mixture with the polypeptide.

5. The method of claim 1, wherein step a) comprises simultaneous contacting of the polypeptide, the potential binding partner, and the metallic nanoparticles.

6. The method of any one of claims 1 to 5, wherein the polypeptide is selected from the group consisting of an antibody, a protein receptor, and a transcription factor.

7. The method of any one of claims 1 to 6, wherein the potential binding partner is a low molecular weight ligand or another protein.

8. The method of any one of claims 1 to 7, wherein the metallic nanoparticles are dispersed in the mixture of step a).

9. The method of any one of claims 1 to 8, wherein the metallic nanoparticles are noble metal nanoparticles.

10. The method of claim 9, wherein the noble metal nanoparticles comprise or consist of a noble metal selected from the group consisting of silver, gold and alloys of the aforementioned materials.

11. The method of any one of claims 1 to 10, wherein the metallic nanoparticles each have a size in a range of about 10 nm to about 100 nm.

~~12. The method of any one of claims 1 to 11, wherein metallic nanoparticles are negatively charged metallic nanoparticles.~~

~~13.~~12. The method according to any one of claims 1 or 2~~to 12~~, wherein excess and/or unreacted potential binding partners are removed from the mixture prior to addition of metallic nanoparticles.

~~14.~~13. The method according to claim ~~13~~12, wherein removing excess and/or unreacted potential binding partners comprises spin filtering the mixture.

~~15.~~14. The method according to any one of claims 1 to ~~14~~ 13, wherein subjecting the mixture to temperature increase comprises heating the mixture at a temperature in the range of about 25 °C to about 90 °C.

~~16.~~15. The method of any one of claims 1 to ~~15~~ 14, wherein the electrolyte is a salt.

~~17.~~16. The method of claim ~~16~~ 15, wherein the salt comprises or consists of sodium chloride.

~~18.~~17. The method of claim ~~16~~ 15 or ~~17~~ 16, wherein concentration of the salt is in a range of about 0.01 M to about 0.5 M.

~~19.~~18. The method of any one of claims 1 to ~~18~~ 17, wherein determining degree of aggregation of metallic nanoparticles is carried out by measuring at least one of (i) optical properties of the metallic nanoparticles, and (ii) size of metallic nanoparticle aggregates.

~~20.~~19. The method of any one of claims 1 to ~~19~~18, wherein binding efficiency of the polypeptide and the potential binding partner is determined by correlating at least one of (i) optical properties of the metallic nanoparticles, and (ii) size of the metallic nanoparticle aggregates to corresponding optical properties of metallic nanoparticles and size of metallic nanoparticle aggregates of another sample, wherein the other sample comprises a known binding partner that binds to the polypeptide with high affinity.

~~21.~~20. The method of claim ~~19~~ 18 or ~~20~~ 19, wherein the optical properties are determined with a naked eye or a spectrophotometer.

~~22.~~21. The method of claim ~~21~~ 20, wherein determining optical properties with a spectrophotometer is carried out with UV-Vis spectrometry at a wavelength range of about 400 nm to about 800 nm.

~~23.~~22. The method of claim 21, wherein excess and/or unreacted potential binding partners are removed from the mixture prior to determining the optical properties with a naked eye.

~~24.~~23. The method of any one of claims 1 to ~~23~~ 22, wherein the method is carried out at ambient conditions.

~~25.~~24. A method for identifying a binding partner for a polypeptide of interest, the method comprising

a) contacting the polypeptide and a candidate binding partner with metallic nanoparticles under conditions that allow polypeptide-nanoparticle conjugate formation;

b) subjecting the conjugate to temperature increase, and optionally ~~at least one of (i)~~ an electrolyte ~~and (ii) temperature increase~~; and

c) determining degree of aggregation of the metallic nanoparticles, wherein a decreased aggregation of the metallic nanoparticles compared to a reference with no binding partner indicates binding of the polypeptide and the candidate binding partner.

CLAIMS

1. A method for determining interaction of a polypeptide with a potential binding partner, the method comprising
   a) providing a mixture comprising the polypeptide, the potential binding partner, and metallic nanoparticles carrying a negative charge at a surface of each of the nanoparticles;
   b) subjecting the mixture to temperature increase and optionally an electrolyte; and
   c) determining the interaction of the polypeptide with the potential binding partner by determining degree of aggregation of the metallic nanoparticles.

2. The method of claim 1, wherein step a) comprises contacting the polypeptide with the potential binding partner, and subsequently contacting the resulting mixture with the metallic nanoparticles.

3. The method of claim 1, wherein step a) comprises contacting the polypeptide with the metallic nanoparticles, and subsequently contacting the resulting mixture with the potential binding partner.

4. The method of claim 1, wherein step a) comprises contacting the potential binding partner with the metallic nanoparticles, and subsequently contacting the resulting mixture with the polypeptide.

5. The method of claim 1, wherein step a) comprises simultaneous contacting of the polypeptide, the potential binding partner, and the metallic nanoparticles.

6. The method of any one of claims 1 to 5, wherein the polypeptide is selected from the group consisting of an antibody, a protein receptor, and a transcription factor.

7. The method of any one of claims 1 to 6, wherein the potential binding partner is a low molecular weight ligand or another protein.

8. The method of any one of claims 1 to 7, wherein the metallic nanoparticles are dispersed in the mixture of step a).

9. The method of any one of claims 1 to 8, wherein the metallic nanoparticles are noble metal nanoparticles.

10. The method of claim 9, wherein the noble metal nanoparticles comprise or consist of a noble metal selected from the group consisting of silver, gold and alloys of the aforementioned materials.

11. The method of any one of claims 1 to 10, wherein the metallic nanoparticles each have a size in a range of about 10 nm to about 100 nm.

12. The method according to any one of claims 1 or 2, wherein excess and/or unreacted potential binding partners are removed from the mixture prior to addition of metallic nanoparticles.

13. The method according to claim 12, wherein removing excess and/or unreacted potential binding partners comprises spin filtering the mixture.

14. The method according to any one of claims 1 to 13, wherein subjecting the mixture to temperature increase comprises heating the mixture at a temperature in the range of about 25 °C to about 90 °C.

15. The method of any one of claims 1 to 14, wherein the electrolyte is a salt.

16. The method of claim 15, wherein the salt comprises or consists of sodium chloride.

17. The method of claim 15 or 16, wherein concentration of the salt is in a range of about 0.01 M to about 0.5 M.

17. The method of claim 15 or 16, wherein concentration of the salt is in a range of about 0.01 M to about 0.5 M.

18. The method of any one of claims 1 to 17, wherein determining degree of aggregation of metallic nanoparticles is carried out by measuring at least one of (i) optical properties of the metallic nanoparticles, and (ii) size of metallic nanoparticle aggregates.

19. The method of any one of claims 1 to 18, wherein binding efficiency of the polypeptide and the potential binding partner is determined by correlating at least one of (i) optical properties of the metallic nanoparticles, and (ii) size of the metallic nanoparticle aggregates to corresponding optical properties of metallic nanoparticles and size of metallic nanoparticle aggregates of another sample, wherein the other sample comprises a known binding partner that binds to the polypeptide with high affinity.

20. The method of claim 18 or 19, wherein the optical properties are determined with a naked eye or a spectrophotometer.

21. The method of claim 20, wherein determining optical properties with a spectrophotometer is carried out with UV-Vis spectrometry at a wavelength range of about 400 nm to about 800 nm.

22. The method of claim 21, wherein excess and/or unreacted potential binding partners are removed from the mixture prior to determining the optical properties with a naked eye.

23. The method of any one of claims 1 to 22, wherein the method is carried out at ambient conditions.

24. A method for identifying a binding partner for a polypeptide of interest, the method comprising

a) contacting the polypeptide and a candidate binding partner with metallic nanoparticles under conditions that allow polypeptide-nanoparticle conjugate formation;

b) subjecting the conjugate to temperature increase, and optionally an electrolyte; and

c) determining degree of aggregation of the metallic nanoparticles, wherein a decreased aggregation of the metallic nanoparticles compared to a reference with no binding partner indicates binding of the polypeptide and the candidate binding partner.