WHAT IS CLAIMED IS:

1. A composition comprising:

a plurality of water-soluble nanoclusters ranging from 2 nm to 500 nm in diameter, each of the nanoclusters containing one or more metal cations, one or more anions, and one or more nonpolymeric water-soluble ligands, wherein the one or more nonpolymeric water-soluble ligands are selected from the group consisting of a monosaccharide, a hydrogenated monosaccharide, a disaccharide, a hydrogenated disaccharide, an oligosaccharide, and an oligosaccharide derivative, polyether, polyol, and the molar ratio among the one or more metal cations, the one or more anions, and the one or more nonpolymeric water-soluble ligands is 1 : 0.1-9 : 0.1-10.

2. The composition of claim 1, wherein the molar ratio among the one or more metal cations, the one or more anions, and the one or more nonpolymeric water-soluble ligands is 1 : 0.5-3 : 1-4.

3. The composition of claim 1, wherein the plurality of nanoclusters have a molecular weight ranging from 3,500 to 1,000,000 Dalton.

4. The composition of claim 3, wherein the one or more nonpolymeric water-soluble ligands are selected from the group consisting of xylitol, isomaltose, isomalt, arabinose, sorbitol, mannitol, and fructooligosaccharide.

5. The composition of claim 4, wherein the one or more metal cations are selected from the group consisting of Fe(II), Fe(III), Ca(II), Mg(II), Al(III), Cr(III), Cu(II), Zn(II), Mn(II), and Ti(IV).

6. The composition of claim 5, wherein the one or more metal cations are selected from the group consisting of Fe(II) and Fe(III); the one or more nonpolymeric water-soluble ligands are selected from the group consisting of sorbitol, xylitol, mannitol, and isomalt; and the one or more anions are selected from the group consisting of carbonate, bicarbonate, phosphate, pyrophosphate, malate, glycerophosphate, and hydroxide.

7. The composition of claim 4, wherein the one or more metal cations are selected from the group consisting of Fe(II) and Fe(III); the one or more nonpolymeric water-soluble ligands are sucrose; and the one or more anions are selected from the group consisting of carbonate, citrate, malate, fumarate, tartrate, oxalate, succinate, ascorbate, malonate, pyrophosphate, glycerophosphate, and lactate.

8. The composition of claim 1, wherein the plurality of nanoclusters have a molecular weight ranging from 3,500 to 300,000 Dalton.

9. The composition of claim 1, wherein the plurality of nanoclusters have a molecular weight ranging from 10,000 to 120,000 Dalton.

10. The composition of claim 1, wherein the composition is a food product.

11. The composition of claim 10, wherein the food is tea, soft drinks, juice, sauce, dressing, salt, candy, milk, coffee, jelly, ice cream, yogurt, cookies, cereals, bread, donut, bagel, chocolates, or snack bars.

12. The composition of claim 1, wherein the composition is a dietary supplement, a cosmetic composition, or a pharmaceutical formulation.

13. The composition of claim 1, wherein the composition is in dry form.

14. The composition of claim 3, wherein the composition is in liquid form

15. The composition of claim 3, wherein the composition is in semi-solid form

16. The composition of claim 14, wherein the composition is a transparent aqueous solution with a pH value not greater than 11.5.

17. The composition of claim 16, wherein the transparent aqueous solution has a pH value not less than 3.5.

18. The composition of claim 17, wherein the one or more nonpolymeric water-soluble ligands are selected from the group consisting of xylitol, sorbitol, sucrose, isomaltose, mannitol, isomalt, and arabinose; the one or more metal cations are selected from the group consisting of Fe(II), Fe(III), Ca(II), Mg(II), Al(III), Cr(III), Cu(II), Zn(II), Mn(II), and Ti(IV); and the one or more anions are selected from the group consisting of carbonate, bicarbonate, citrate, malate, fumarate, tartrate, lactate, oxalate, malonate, gluconate, succinate, ascorbate, phosphate, pyrophosphate, glycerophosphate, and hydroxide.

19. The composition of claim 18, wherein the one or more metal cations are selected from the group consisting of Fe(II) and Fe(III); the one or more nonpolymeric water-soluble ligands are selected from the group consisting of sorbitol, xylitol, mannitol, oligosaccharide, and isomalt, and the one or more anions are selected from the group consisting of carbonate, bicarbonate, phosphate, pyrophosphate, malate, fumarate, tartrate, lactate, oxalate, succinate, malonate, gluconate, ascorbate, glycerophosphate, and hydroxide.

20. The composition of claim 18, wherein the one or more metal cations are selected from the group consisting of Fe(II) and Fe(III); the one or more nonpolymeric water-soluble ligands are sucrose, and the one or more anions are selected from the group consisting of carbonate, hydroxide, citrate, malate, fumarate, tartrate, oxalate, succinate, malonate, gluconate, ascorbate, pyrophosphate, glycerophosphate, and lactate.

21. The composition of claim 1, wherein the plurality of nanoclusters range from 2 nm to 90 nm in diameter.

22. A composition comprising:

a plurality of water-soluble nanoclusters ranging from 2 nm to 500 nm in diameter, each of the nanoclusters containing one or more metal cations, one or more

anions, and one or more water-soluble ligands, wherein the one or more metal cations are selected from the group consisting of cations of Cr, Al, Bi, Zn, Ba, Cu, Ti, Mg, Mn, Bi, Ca, Se, In, Pt, and Zr; the one or more water-soluble ligands are selected from the group consisting of a carbohydrate, a carbohydrate derivative, an amino acid, a polyether, polyol, and a polypeptide; and the molar ratio among the one or more metal cations, the one or more anions, and the one or more water-soluble ligands is 1 : 0.1-9 : 0.1-10.

23. The composition of claim 22, wherein the plurality of nanoclusters have a molecular weight ranging from 3,500 to 1,000,000 Dalton.

24. The composition of claim 23, wherein the one or more water-soluble ligands are selected from the group consisting of xylitol, isomaltose, isomalt, sorbitol, arabinose, mannitol, and fructooligosaccharide.

25. The composition of claim 24, wherein the one or more metal cations are selected from the group consisting of Mg(II), Al(III), Ca(II), Cr(III), Cu(II), Zn(II),
Mn (II), and Ti(IV).

26. The composition of claim 23, wherein the plurality of nanoclusters have a molecular weight ranging from 3,500 to 300,000 Dalton

27. The composition of claim 23, wherein the plurality of nanoclusters have a molecular weight ranging from 10,000 to 120,000 Dalton.

28. The composition of claim 22, wherein the composition is a food product.

29. The composition of claim 28, wherein the food is tea, soft drinks, juice, milk, coffee, jelly, ice cream, yogurt, cookies, cereals, bread, donut, bagel, chocolates, or snack bars.

30. The composition of claim 22, wherein the composition is a dietary supplement, a cosmetic composition, or a pharmaceutical formulation.

31. The composition of claim 22, wherein the composition is in dry form.

32. The composition of claim 22, wherein the composition is in liquid form.

33. The composition of claim 33, wherein the composition is a transparent aqueous solution having a pH value between 3.5 and 11.5.

34. The composition of claim 22, wherein the plurality of nanoclusters range from 2 nm to 150 nm in diameter.

35. An iron-containing composition comprising:

a plurality of water-soluble nanoclusters ranging from 2 nm to 500 nm in diameter, each of the nanoclusters containing one or more iron cations, one or more anions, and one or more nonpolymeric water-soluble ligands, wherein the one or more nonpolymeric water-soluble ligands are selected from the group consisting of xylitol, isomaltose, isomalt, arabinose, sorbitol, mannitol, and fructooligosaccharide, and the molar ratio among the one or more iron cations, the one or more anions, and the one or more nonpolymeric water-soluble ligands is 1 : 0.1-9 : 0.1-10.

36. The composition of claim 35, wherein the plurality of nanoclusters have a molecular weight ranging from 3,500 to 1,000,000 Dalton.

37. A method for making a composition comprising a plurality of water-soluble nanoclusters, the method comprising:

providing a first transparent aqueous solution containing one or more water-soluble salts and one or more water-soluble ligands, wherein the one or more water-soluble salts include one or more metal cations; the one or more water-soluble ligands are selected from the group consisting of a carbohydrate, a carbohydrate derivative, an amino acid, a polyether, and a polypeptide; and the molar ratio between the one or

more metal cations and the one or more water-soluble ligands is 1 : 0.1-10; and mixing the first transparent aqueous solution with one or more alkaline anions to obtain a second transparent aqueous solution having a pH value ranging between 3.5 and 11.5, such that a plurality of water-soluble nanoclusters are formed, each ranging from
2 nm to 500 nm in diameter and containing the one or more metal cations, the one or more alkaline anions, and the one or more water-soluble ligands.

38. The method of claim 37, further comprising isolating the plurality of water-soluble nanoclusters from the second transparent aqueous solution by filtrating the second transparent aqueous solution through a molecular membrane with a cut-off at 3,500 Dalton or by adding a water soluble organic solvent into the second transparent aqueous solution to precipitate the plurality of water-soluble nanoclusters.

39. The method of claim 37, wherein the one or more water-soluble ligands are selected from the group consisting of a monosaccharide, a disaccharide, an oligosaccharide, and a derivative thereof.

40. The method of claim 39, wherein the one or more water-soluble ligands are naturally occurring carbohydrates.

41. The method of claim 39, wherein the plurality of water-soluble nanoclusters each has a molar ratio among the one or more metal cations, the one or more alkaline anions, and the one or more water-soluble ligands being 1 : 0.1-9 : 0.1-10.

42. A method for treating an iron deficiency disorder, the method comprising administering to a subject in need thereof an effective amount of the composition of claim 1, wherein the one or more metal cations include iron cations.

43 The method of claim 42, wherein the iron deficiency disorder is anemia.

44. A method for treating an iron deficiency disorder, the method comprising administering to a subject in need thereof an effective amount of the composition of claim 35.

45. The method of claim 44, wherein the iron deficiency disorder is anemia.

46. A method for treating type II diabetes, comprising administering to a subject in need thereof an effective amount of the composition of claim 1, wherein the one or more metal cations include chromium cations.

47. A method for treating type II diabetes, comprising administering to a subject in need thereof an effective amount of the composition of claim 22, wherein the one or more metal cations include chromium cations.

48. A method for lowering cholesterol levels, comprising administering to a subject in need thereof an effective amount of the composition of claim 1, wherein the one or more metal cations include chromium cations.

49. A method for lowering cholesterol levels, comprising administering to a subject in need thereof an effective amount of the composition of claim 21, wherein the one or more metal cations include chromium cations.

50. A method for treating a gastric reflux disorder, the method comprising administering to a subject in need thereof an effective amount of the composition of claim 1, wherein the one or more metal cations are selected from the group consisting of aluminum, ferric, and magnesium cations.

51. The method of claim 50, wherein the gastric reflux disorder is heartburn or gastrointestinal ulcers.

52. A method for treating a gastric reflux disorder, the method comprising administering to a subject in need thereof an effective amount of the composition of

claim 21, wherein the one or more metal cations are selected from the group consisting of aluminum, ferric, bismuth, and magnesium cations.

53 The method of claim 52, wherein the gastric reflux disorder is heartburn or gastrointestinal ulcers.

WHAT IS CLAIMED IS:

1. A composition comprising:

a plurality of water-soluble nanoclusters ranging from 2 nm to 500 nm in diameter, each of the nanoclusters containing one or more metal cations, one or more anions, and one or more nonpolymeric water-soluble ligands, wherein the one or more nonpolymeric water-soluble ligands are selected from the group consisting of a monosaccharide, a hydrogenated monosaccharide, a disaccharide, a hydrogenated disaccharide, an oligosaccharide, and an oligosaccharide derivative, polyether, polyol, and the molar ratio among the one or more metal cations, the one or more anions, and the one or more nonpolymeric water-soluble ligands is 1 : 0.1-9 : 0.1-10, wherein the water-soluble nanoclusters are prepared by a method including the following steps:

providing a first transparent aqueous solution containing one or more water-soluble salts and the one or more water-soluble ligands, in which the one or more water-soluble salts include the one or more metal cations; and the molar ratio between the one or more metal cations and the one or more water-soluble ligands is 1 : 0.1-10; and

mixing the first transparent aqueous solution with the one or more anions at 80 – 135°C to obtain a second transparent aqueous solution having a pH value ranging between 3.5 and 11.5, such that a plurality of water-soluble nanoclusters are formed, each ranging from 2 nm to 500 nm in diameter and containing the one or more metal cations, the one or more anions, and the one or more water-soluble ligands.

2. The composition of claim 1, wherein the molar ratio among the one or more metal cations, the one or more anions, and the one or more nonpolymeric water-soluble ligands is 1 : 0.5-3 : 1-4.

3. The composition of claim 1 or 2, wherein the plurality of nanoclusters have a molecular weight ranging from 3,500 to 1,000,000 Dalton.

4. The composition of claim 3, wherein the one or more nonpolymeric water-soluble ligands are selected from the group consisting of xylitol, isomaltose, isomalt, arabinose, sorbitol, mannitol, and fructooligosaccharide.

5. The composition of claim 4, wherein the one or more metal cations are selected from the group consisting of Fe(II), Fe(III), Ca(II), Mg(II), Al(III), Cr(III), Cu(II), Zn(II), Mn(II), and Ti(IV).

6. The composition of claim 5, wherein the one or more metal cations are selected from the group consisting of Fe(II) and Fe(III); the one or more nonpolymeric water-soluble ligands are selected from the group consisting of sorbitol, xylitol, mannitol, and isomalt; and the one or more anions are selected from the group consisting of carbonate, bicarbonate, phosphate, pyrophosphate, malate, glycerophosphate, and hydroxide.

7. The composition of claim 4, wherein the one or more metal cations are selected from the group consisting of Fe(II) and Fe(III); the one or more nonpolymeric water-soluble ligands are sucrose; and the one or more anions are selected from the group consisting of carbonate, citrate, malate, fumarate, tartrate, oxalate, succinate, ascorbate, malonate, pyrophosphate, glycerophosphate, and lactate.

8. The composition of claim 1 or 2, wherein the plurality of nanoclusters have a molecular weight ranging from 3,500 to 300,000 Dalton.

9. The composition of claim 1 or 2, wherein the plurality of nanoclusters have a molecular weight ranging from 10,000 to 120,000 Dalton.

10. The composition of any one of claims 1 to 9, wherein the composition is a food product.

11. The composition of claim 10, wherein the food is tea, soft drinks, juice, sauce, dressing, salt, candy, milk, coffee, jelly, ice cream, yogurt, cookies, cereals, bread, donut, bagel, chocolates, or snack bars.

12. The composition of any one of claims 1 to 9, wherein the composition is a

dietary supplement, a cosmetic composition, or a pharmaceutical formulation.

13. The composition of any one of claims 1 to 12, wherein the composition is in dry form.

14. The composition of claim 3, wherein the composition is in liquid form.

15. The composition of claim 3, wherein the composition is in semi-solid form.

16. The composition of claim 14, wherein the composition is a transparent aqueous solution with a pH value not greater than 11.5.

17. The composition of claim 16, wherein the transparent aqueous solution has a pH value not less than 3.5.

18. The composition of claim 17, wherein the one or more nonpolymeric water-soluble ligands are selected from the group consisting of xylitol, sorbitol, sucrose, isomaltose, mannitol, isomalt, and arabinose; the one or more metal cations are selected from the group consisting of Fe(II), Fe(III), Ca(II), Mg(II), Al(III), Cr(III), Cu(II), Zn(II), Mn(II), and Ti(IV); and the one or more anions are selected from the group consisting of carbonate, bicarbonate, citrate, malate, fumarate, tartrate, lactate, oxalate, malonate, gluconate, succinate, ascorbate, phosphate, pyrophosphate, glycerophosphate, and hydroxide.

19. The composition of claim 18, wherein the one or more metal cations are selected from the group consisting of Fe(II) and Fe(III); the one or more nonpolymeric water-soluble ligands are selected from the group consisting of sorbitol, xylitol, mannitol, oligosaccharide, and isomalt, and the one or more anions are selected from the group consisting of carbonate, bicarbonate, phosphate, pyrophosphate, malate, fumarate, tartrate, lactate, oxalate, succinate, malonate, gluconate, ascorbate, glycerophosphate, and hydroxide.

20. The composition of claim 18, wherein the one or more metal cations are

selected from the group consisting of Fe(II) and Fe(III); the one or more nonpolymeric water-soluble ligands are sucrose, and the one or more anions are selected from the group consisting of carbonate, hydroxide, citrate, malate, fumarate, tartrate, oxalate, succinate, malonate, gluconate, ascorbate, pyrophosphate, glycerophosphate, and lactate.

21. The composition of claim 1 or 2, wherein the plurality of nanoclusters range from 2 nm to 90 nm in diameter.

22. The composition of claim 1 or 2, wherein the one or more metal cations are selected from the group consisting of cations of Cr, Al, Bi, Zn, Ba, Cu, Ti, Mg, Mn, Bi, Ca, Se, In, Pt, and Zr; and the one or more water-soluble ligands are selected from the group consisting of a carbohydrate, a carbohydrate derivative, an amino acid, a polyether, polyol, and a polypeptide.

23. The composition of claim 22, wherein the plurality of nanoclusters have a molecular weight ranging from 3,500 to 1,000,000 Dalton.

24. The composition of claim 23, wherein the one or more water-soluble ligands are selected from the group consisting of xylitol, isomaltose, isomalt, sorbitol, arabinose, mannitol, and fructooligosaccharide.

25. The composition of claim 24, wherein the one or more metal cations are selected from the group consisting of Mg(II), Al(III), Ca(II), Cr(III), Cu(II), Zn(II), Mn (II), and Ti(IV).

26. The composition of claim 23, wherein the plurality of nanoclusters have a molecular weight ranging from 3,500 to 300,000 Dalton.

27. The composition of claim 23, wherein the plurality of nanoclusters have a molecular weight ranging from 10,000 to 120,000 Dalton.

28. The composition of any one of claims 22 to 27, wherein the composition is

a food product.

29. The composition of claim 28, wherein the food is tea, soft drinks, juice, milk, coffee, jelly, ice cream, yogurt, cookies, cereals, bread, donut, bagel, chocolates, or snack bars.

30. The composition of any one of claims 22 to 27, wherein the composition is a dietary supplement, a cosmetic composition, or a pharmaceutical formulation.

31. The composition of claim 22, wherein the composition is in dry form.

32. The composition of claim 22, wherein the composition is in liquid form.

33. The composition of claim 32, wherein the composition is a transparent aqueous solution having a pH value between 3.5 and 11.5.

34. The composition of claim 22, wherein the plurality of nanoclusters range from 2 nm to 150 nm in diameter.

35. The composition of claim 1, wherein each of the nanoclusters containing one or more iron cations, one or more anions, and one or more nonpolymeric water-soluble ligands, and the one or more nonpolymeric water-soluble ligands are selected from the group consisting of xylitol, isomaltose, isomalt, arabinose, sorbitol, mannitol, and fructooligosaccharide, and the molar ratio among the one or more iron cations, the one or more anions, and the one or more nonpolymeric water-soluble ligands is 1 : 0.1-9 : 0.1-10.

36. The composition of claim 35, wherein the plurality of nanoclusters have a molecular weight ranging from 3,500 to 1,000,000 Dalton.

37. A method for making a composition comprising a plurality of water-soluble nanoclusters, the method comprising:

providing a first transparent aqueous solution containing one or more water-soluble salts and one or more water-soluble ligands, wherein the one or more water-soluble salts include one or more metal cations; the one or more water-soluble ligands are selected from the group consisting of a carbohydrate, a carbohydrate derivative, an amino acid, a polyether, and a polypeptide; and the molar ratio between the one or more metal cations and the one or more water-soluble ligands is 1 : 0.1-10; and mixing the first transparent aqueous solution with one or more alkaline anions at 80 – 135°C to obtain a second transparent aqueous solution having a pH value ranging between 3.5 and 11.5, such that a plurality of water-soluble nanoclusters are formed, each ranging from 2 nm to 500 nm in diameter and containing the one or more metal cations, the one or more alkaline anions, and the one or more water-soluble ligands.

38. The method of claim 37, further comprising isolating the plurality of water-soluble nanoclusters from the second transparent aqueous solution by filtrating the second transparent aqueous solution through a molecular membrane with a cut-off at 3,500 Dalton or by adding a water soluble organic solvent into the second transparent aqueous solution to precipitate the plurality of water-soluble nanoclusters.

39. The method of claim 37 or 38, wherein the one or more water-soluble ligands are selected from the group consisting of a monosaccharide, a disaccharide, an oligosaccharide, and a derivative thereof.

40. The method of claim 39, wherein the one or more water-soluble ligands are naturally occurring carbohydrates.

41. The method of claim 39, wherein the plurality of water-soluble nanoclusters each has a molar ratio among the one or more metal cations, the one or more alkaline anions, and the one or more water-soluble ligands being 1 : 0.1-9 : 0.1-10.

42. Use of an effective amount of the composition of claim 1 in manufacturing a medicament for treating an iron deficiency disorder in a subject in need thereof, wherein the one or more metal cations include iron cations.

43. The use of claim 42, wherein the iron deficiency disorder is anemia.

44. Use of an effective amount of the composition of claim 35 in manufacturing a medicament for treating an iron deficiency disorder in a subject in need thereof.

45. The use of claim 44, wherein the iron deficiency disorder is anemia.

46. Use of an effective amount of the composition of claim 1 in manufacturing a medicament for treating type II diabetes in a subject in need thereof, wherein the one or more metal cations include chromium cations.

47. Use of an effective amount of the composition of claim 22 in manufacturing a medicament for treating type II diabetes in a subject in need thereof, wherein the one or more metal cations include chromium cations.

48. Use of an effective amount of the composition of claim 1 in manufacturing a medicament for lowering cholesterol levels in a subject in need thereof, wherein the one or more metal cations include chromium cations.

49. Use of an effective amount of the composition of claim 21 in manufacturing a medicament for lowering cholesterol levels in a subject in need thereof, wherein the one or more metal cations include chromium cations.

50. Use of an effective amount of the composition of claim 1 in manufacturing a medicament for treating a gastric reflux disorder in a subject in need thereof, wherein the one or more metal cations are selected from the group consisting of aluminum, ferric, and magnesium cations.

51. The use of claim 50, wherein the gastric reflux disorder is heartburn or gastrointestinal ulcers.

52. Use of an effective amount of the composition of claim 21 in manufacturing a medicament for treating a gastric reflux disorder in a subject in need thereof, wherein the one or more metal cations are selected from the group consisting of aluminum, ferric, bismuth, and magnesium cations.

53. The use of claim 52, wherein the gastric reflux disorder is heartburn or gastrointestinal ulcers.

54. A composition made by the method of any one of claims 37 to 41.