CLAIMS

1. A composition comprising:

a shell surrounding an interior compartment, said interior compartment comprising one or more reagent,

wherein said shell releases said interior compartment when said shell is exposed to a first release condition, and said interior compartment prevents release of said one or more reagent when said shell is exposed to said first release condition,

wherein said interior compartment releases said one or more reagent when said interior compartment is exposed to a second release condition, and wherein said first release condition is different from said second release condition.

2. The composition of claim 1, wherein said first release condition and said second release condition are each independently selected from a temperature-controlled release condition, a pH-controlled release condition, a time-controlled release condition, a position-controlled release condition, or any combination thereof.

3. The composition of claim 1, wherein either or both of the first and second release conditions comprise a change in temperature.

4. The composition of claim 3, wherein the change in temperature is to a temperature above about 25 ˚C.

5. The composition of claim 1, wherein said shell releases said interior compartment when said shell is exposed to at least one additional shell release condition, wherein one or more of said at least one additional shell release condition is different from said first release condition.

6. The composition of claim 1, wherein said interior compartment releases said one or more reagent when said interior compartment is exposed to at least one additional interior compartment release condition, wherein one or more of said at least one additional interior compartment release condition is different from said second release condition.

7. The composition of any one of claims 1 through 6, wherein said shell comprises a water-soluble compound.

8. The composition of any one of claims 1 through 7, wherein said shell comprises one or more of polyvinyl alcohol, polyvinylpyrrolidone (PVP), carrageenan, gelatin, hydroxypropyl methylcellulose (HPMC), pullulan, starch film, benzoxaborole-poly(vinyl alcohol) (benzoxaborole-PVA), pectin, or any combination thereof.

9. The composition of any one of claims 1 through 8, wherein said one or more reagent is a sequencing reagent, a sample preparation reagent, a library preparation reagent, or any combination thereof.

10. The composition of any one of claims 1 through 9, wherein said one or more reagent is selected from one or more enzyme, salt, surfactant, buffering agent, enzyme inhibitor, primer, nucleotide, organic osmolite, magnetic bead, molecular probe, crowding agent, small molecule, labelled-nucleotide, or any combination thereof.

11. The composition of any one of claims 1 through 10, further comprising a water purification compound, wherein the water purification compound comprises sodium dichloroisocyanurate, chlorine, chloramines, chlorine dioxide, polyaluminium chloride, aluminum sulfate, ferric sulfate, hydrogen peroxide, sodium hydroxide bromide, silver nanoparticles, iron, iodine, activated carbon, or any combination thereof.

12. The composition of any one of claims 1 through 11, wherein said interior compartment comprises one or more dry reagent, one or more microsphere, one or more bead, one or more powder, one or more cake, one or more gel, one or more liquid, or any combination thereof.

13. The composition of any one of claims 1 through 12, wherein said one or more reagent is lyophilised.

14. The composition of any one of claims 1 through 13, wherein said interior compartment comprises a plurality of microspheres comprising one reagent or a plurality of reagents.

15. A method for controlling release of one or more reagent, said method comprising:

exposing a composition comprising a shell surrounding an interior compartment to a first release condition to release said interior compartment, wherein said interior compartment comprises one or more reagent; and

exposing said interior compartment to a second release condition to release said one or more reagent, wherein said first release condition is different from said second release condition.

16. The method of claim 15, wherein said interior compartment prevents release of said one or more reagent when said shell is exposed to said first release condition.

17. The method of claim 15, wherein said first release condition occurs before said second release condition.

18. The method of claim 15, wherein said first release condition comprises a temperature-controlled release condition, a pH-controlled release condition, a time-controlled release condition, a position-controlled release condition, or any combination thereof.

19. The method of claim 15, wherein said second release condition comprises a temperature-controlled release condition, a pH-controlled release condition, a time-controlled release condition, a position-controlled release condition, or any combination thereof.

20. The method of claim 15, wherein either or both of the first and second release conditions comprise a change in temperature.

21. The method of claim 20, wherein the change in temperature is to a temperature above about 25 ˚C.

22. The method of any one of claims 15 through 21, wherein said first release condition comprises a pH of between about 1.0 and about 10.0.

23. The method of any one of claims 15 through 22, wherein said second release condition comprises a pH of between about 1.0 and about 10.0.

24. The method of any one of claims 15 through 23, wherein said shell releases said interior compartment when said shell is exposed to at least one additional shell release condition, wherein one or more of said at least one additional shell release condition is different from said first release condition.

25. The method of claim 24, wherein said interior compartment prevents release of said one or more reagent when said shell is exposed to said at least one additional shell release condition.

26. The method of any one of claims 15 through 25, wherein said interior compartment releases said one or more reagent when said interior compartment is exposed to at least one additional interior compartment release condition, wherein one or more of said at least one additional interior compartment release condition is different from said second release condition.

27. The method of any one of claims 15 through 26, wherein said shell has a shell width and said interior compartment has an interior compartment width, and wherein said shell width is different from said interior compartment width, wherein said shell width is between about 1 micrometer and about 1,000 micrometers.

28. The method of any one of claims 15 through 27, wherein said shell comprises one or more of polyvinyl alcohol, polyvinylpyrrolidone (PVP), carrageenan, gelatin, hydroxypropyl methylcellulose (HPMC), pullulan, starch film, benzoxaborole-poly(vinyl alcohol) (benzoxaborole-PVA), pectin, or any combination thereof.

29. The method of any one of claims 15 through 28, wherein said one or more reagent is a sequencing reagent, a sample preparation reagent, a library preparation reagent, or a combination thereof.

30. The method of any one of claims 15 through 29, wherein said one or more reagent is selected from one or more enzyme, salt, surfactant, buffering agent, enzyme inhibitor, primer, nucleotide, organic osmolite, magnetic bead, molecular probe, crowding agent, small molecule, labelled-nucleotide, or any combination thereof.

31. The method of any one of claims 15 through 30, wherein either or both of said shell and said interior compartment further comprises a water purification compound.

32. The method of claim 31, wherein said water purification compound comprises sodium dichloroisocyanurate, chlorine, chloramines, chlorine dioxide, polyaluminium chloride, aluminum sulfate, ferric sulfate, hydrogen peroxide, sodium hydroxide bromide, silver nanoparticles, iron, iodine, activated carbon, or any combination thereof.

33. The method of claim 31 or 32, wherein said water purification compound substantially or completely degrades upon exposure to a degradation condition.

34. The method of claim 33, wherein said degradation condition comprises a change in temperature.

35. The method of claim 34, wherein said change in temperature is to a temperature at or above 25 ˚C.

36. The method of any one of claims 15 through 35, wherein said interior compartment comprises one or more dry reagent, one or more microsphere, one or more bead, one or more powder, one or more cake, one or more gel, one or more liquid, or any combination thereof.

37. The method of any one of claims 15 through 36, wherein said one or more reagent is lyophilised.