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,

wherein either or both of the first and second release conditions comprise a change in temperature,

wherein said shell is dissolvable and comprises a water-soluble compound, and

wherein the composition further comprises a water purification compound in a position between the shell and the interior compartment.

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 both of the first and second release conditions comprise a change in temperature.

4. The composition of claim 1 or 3, wherein the change in temperature is to a temperature above 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 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.

8. The composition of any one of claims 1 through 7, wherein said one or more reagent is a sequencing reagent, a sample preparation reagent, a library preparation reagent, or any combination thereof.

9. The composition of any one of claims 1 through 8, 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.

10. The composition of any one of claims 1 through 9, 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.

11. The composition of any one of claims 1 through 10, 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.

12. The composition of any one of claims 1 through 11, wherein said one or more reagent is lyophilised.

13. The composition of any one of claims 1 through 12, wherein;

(i) said interior compartment comprises a plurality of microspheres comprising one reagent; or

(ii) said interior compartment comprises a plurality of microspheres comprising a plurality of reagents wherein each of the plurality of microspheres includes a plurality of reagents or wherein the plurality of microspheres collectively includes a plurality of reagents.

14. 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 wherein said interior compartment prevents release of said one or more reagent when said shell is exposed to said first release condition; 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 and wherein said first release condition occurs before said second release condition,

wherein either or both of the first and second release conditions comprise a change in temperature,

wherein said shell is dissolvable and comprises a water-soluble compound, and

wherein the composition further comprises a water purification compound in a position between the shell and the interior compartment.

15. The method of claim 14, 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.

16. The method of claim 14, 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.

17. The method of claim 14, wherein both of the first and second release conditions comprise a change in temperature.

18. The method of claim 14 or 17, wherein the change in temperature is to a temperature above 25 ˚C.

19. The method of any one of claims 14 through 16, wherein said first release condition comprises a pH of between 1.0 and 10.0.

20. The method of any one of claims 14 through 16, wherein said second release condition comprises a pH of between 1.0 and 10.0.

21. The method of any one of claims 14 through 20, 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.

22. The method of claim 21, 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.

23. The method of any one of claims 14 through 22, 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.

24. The method of any one of claims 14 through 23, 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 1 micrometer and 1,000 micrometers.

25. The method of any one of claims 14 through 24, 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.

26. The method of any one of claims 14 through 25, wherein said one or more reagent is a sequencing reagent, a sample preparation reagent, a library preparation reagent, or a combination thereof.

27. The method of any one of claims 14 through 26, 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.

28. The method of any one of claims 14 through 27, 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.

29. The method of any one of claims 14 through 28, wherein said water purification compound degrades upon exposure to a degradation condition.

30. The method of claim 29, wherein said degradation condition comprises a change in temperature.

31. The method of claim 30, wherein said change in temperature is to a temperature at or above 25 ˚C.

32. The method of any one of claims 14 through 31, 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.

33. The method of any one of claims 14 through 32, wherein said one or more reagent is lyophilised.