CLAIMS

WHAT IS CLAIMED IS:

1. A composition comprising a plurality of first surfactant molecules comprising a tail portion and a head portion, wherein the first surfactant molecules comprise an average of 2-10 of a first linkage moiety per surfactant molecule wherein the first linkage moieties are configured to either

(i) link with each other under suitable conditions,

(ii) to link with a second linkage moiety under suitable conditions, wherein the second linkage moiety is attached to a second surfactant molecule comprising a tail portion and a head portion, and wherein the second linkage moiety is different from the first linkage moiety, or

(iii) to link with an intermediate linkage moiety under suitable conditions, or a combination thereof.

~~2. The composition of claim 1 wherein the first linkage moieties are attached to the tail portion of the first surfactant molecules.~~

~~3. The composition of claim 1 wherein the first linkage moieties are attached to the head portion of the first surfactant molecules.~~

~~4. The composition of any of the previous claims wherein the second linkage moieties are attached to the head portion of the second surfactant molecules.~~

~~5. The composition of any of claims 1-3 wherein the second linkage moieties are attached to the tail portion of the second surfactant molecules.~~

~~6. The composition of any of the previous claims wherein the linkage moieties are configured to form one or more covalent bonds under suitable conditions.~~

~~7. The composition of any of the previous claims wherein the linkage moieties are configured to form one or more noncovalent bonds under suitable conditions.~~

~~8. The composition of any of the previous claims further comprising a plurality of the second surfactant molecules, wherein the second surfactant molecules comprise an average of 2-10 of the second linkage moiety per surfactant molecule.~~

~~9. The composition of any of the previous claims wherein the first and second linkage moieties are oppositely charged.~~

2. ~~10.~~ The composition of ~~any of the previous claims~~ claim 1 further comprising a continuous phase containing the first surfactant molecules and/or the second surfactant molecules and a dispersed phase, wherein the dispersed phase does not contain the first and/or second surfactant molecules and, optionally, does contain the intermediate moiety linkage.

~~11. The composition any of the previous claims further comprising a continuous phase containing the second surfactant molecules.~~

~~12. The composition of claims 10 or 11 further comprising a dispersed phase~~

~~13. The composition of claim 12 wherein the dispersed phase does not contain the first surfactant molecule~~

~~14. The composition of claim 12 or 13 wherein the dispersed phase does not contain the second surfactant molecule.~~

~~15. The composition of claim 12 wherein the dispersed phase contains the intermediate linkage moiety.~~

3. ~~16.~~ The composition of ~~any of the previous claims~~ claim 1 further comprising a dispersed phase containing the first surfactant molecules and/or the second surfactant molecules, and a

continuous phase, wherein the continuous phase does not contain the first and/or second surfactant molecules and, optionally, does contain the intermediate linkage moiety.

~~17. The composition of any of the previous claims further comprising a dispersed phase containing the second surfactant molecules.~~

~~18. The composition of claim 16 or 17 further comprising a continuous phase~~

~~19. The composition of claim 18 wherein the continuous phase does not contain the first surfactant molecule~~

~~20. The composition of claim 18 wherein the continuous phase does not contain the second surfactant molecule.~~

~~21. The composition of claim 18 wherein the continuous phase contains the intermediate linkage moiety.~~

4. ~~22.~~ The composition of any of ~~the previous~~ claims 1 through 3 wherein the surfactant moieties comprise the first linkage moiety comprising biotin and the intermediate linkage moieties comprising one or more biotin-binding moieties comprising streptavidin or a streptavidin derivative.

~~23. The composition of claim 22 wherein the biotin-binding moieties comprise streptavidin or a streptavidin derivative.~~

~~24. The composition of claim any of claims 6-23 wherein the surfactant molecules form micelles in the continuous phase.~~

~~25. The composition of any of claims 6-24 wherein the continuous phase comprises an oil.~~

~~26. The composition of claim 25 wherein the oil comprises a hydrocarbon or a silicon oil.~~

5. ~~27.~~ The composition of ~~claim 25~~ any one of claims 2 through 4 wherein the ~~oil~~ continuous phase comprises a fluorinated oil and the surfactant is a fluorosurfactant.

~~28. The composition of claim 1 wherein the surfactant is a fluorosurfactant.~~

6. ~~29.~~ A composition comprising an emulsion comprising partitions of a dispersed phase in a continuous phase, wherein the partitions of the dispersed phase comprise a plurality of surfactant molecules comprising a tail portion and a head portion that are situated at the interface of the partitions with the continuous phase to form a layer of surfactant molecules, and wherein the plurality of surfactant molecules are cross-linked to each other to form a cross-linked network of surfactant molecules.

7. ~~30.~~ The composition of claim ~~29~~6 wherein the degree of cross-linking of the cross-linked network of surfactant molecules is 20-100% and the cross-linking is via cross links having an average length of 5-500% of the length of the tail portion of the surfactant.

~~31. The composition of claim 29 or 30 wherein the cross-linking is via cross links having an average length of 5-500% of the length of the tail portion of the surfactant.~~

~~32. The composition of any of claims 29-31 wherein the surfactant molecules are cross-linked to each other at the tail portions of the surfactant molecules.~~

~~33. The composition of any of claims 29-31 wherein the surfactant molecules are cross-linked to each other at the head portions of the surfactant molecules.~~

8. ~~34.~~ The composition of ~~any of claims 29-33~~ claim 6 or claim 7 wherein a first portion of the surfactant molecules comprise a first linkage moiety that forms part of the cross-links, and wherein the average number of first linkage moieties per surfactant molecule is 2-10.

9. ~~35.~~ The composition of any of claims ~~29-34~~6-9 wherein a second portion of the surfactant molecules comprise a second linkage moiety, different from the first linkage moiety, that forms part of the cross-links, and wherein the average number of second linkage moieties per surfactant molecule is 2-10.

10. ~~36.~~ The composition of any of claims ~~29-35~~ 6-9 wherein the surfactant molecules are cross-linked via cross-links where the average length of the cross-links is 1-100 nm.

11.~~37.~~ The composition of any of claims ~~29-36~~ 6-10 wherein the dispersed phase comprises an aqueous phase ~~and~~ , the continuous phase comprises a~~n~~ fluorinated oil and the surfactant comprises a fluorosurfactant.

~~38. The composition of claim 37 wherein the oil comprises a fluorinated oil.~~

~~39. The composition of any of claims 29-38 wherein the surfactant comprises a fluorosurfactant.~~

~~40. The composition of any of claims 29-39 wherein the surfactant molecules are cross-linked by noncovalent bonds.~~

~~41. The composition of any of claims 29-39 wherein the surfactant molecules are cross-linked by covalent bonds.~~

12.~~42.~~ The composition of any of claims ~~29-40~~ 6-11 wherein the surfactant molecules comprise biotin moieties ~~and~~ that are cross-linked by biotin-binding moieties comprising streptavidin or a streptavidin derivative.

~~43. The composition of claim 42 wherein the biotin-binding moieties comprise streptavidin or a streptavidin derivative.~~

13.~~44.~~ The composition of claim 12~~43~~ wherein the surfactant molecules comprise an average of 2-10 biotin moieties per surfactant molecule.

~~45. The composition of any of claims 29-44 wherein the cross-linked network of surfactant molecules increases the stability of the partitions in the emulsion, compared to the same emulsion without a cross-linked surfactant network, as measured by a decrease in dye diffusion of at least 20% in a dye diffusion test.~~

~~46. The composition of any of claims 29-45wherein the cross-linked network of surfactant molecules increases the stability of the partitions in the emulsion, compared to the same emulsion without a cross-linked surfactant network, as measured by a PCR test, by at least 20%.~~

~~47. The composition of any of claims 29-46 wherein the cross-linked network of surfactant molecules increases the stability of the partitions in the emulsion, compared to the same emulsion without a cross-linked surfactant network, as measured by a coalescence assay by at least 20%.~~

14~~48.~~ A method of conducting a process in an emulsion of partitions of a dispersed phase in a continuous phase, comprising

(i) providing the emulsion of partitions of dispersed phase in continuous phase, wherein the partitions of the dispersed phase comprise a plurality of surfactant molecules comprising a tail portion and a head portion that are situated at an interface of the partitions with the continuous phase to form a layer of surfactant molecules, and wherein the plurality of surfactant molecules are cross-linked to each other to form a cross-linked network of surfactant molecules; and

(ii) performing the process on the partitions.

15.~~49.~~ The method of claim 14~~48~~ wherein the degree of cross-linking of the cross-linked network of surfactant molecules is 20-100% and the cross links have an average length of 5-500% of the length of the tail portion of the surfactant.

~~50. The method of claim 48 or 49 wherein the cross-linking is via cross links having an average length of 5-500% of the length of the tail portion of the surfactant.~~

~~51. The method of any of claims 48-50 wherein the surfactant molecules are cross-linked to each other at the tail portions of the surfactant molecules.~~

~~52. The method of any of claims 48-50 wherein the surfactant molecules are cross-linked to each other at the head portions of the surfactant molecules.~~

~~53. The method of any of claims 48-52 wherein a first portion of the surfactant molecules comprise a first linkage moiety that forms part of the cross-links, and wherein the average number of first linkage moieties per surfactant molecule is 2-10.~~

~~54. The method of any of claims 48-53 wherein a second portion of the surfactant molecules comprise a second linkage moiety, different from the first linkage moiety, that forms part of the cross-links, and wherein the average number of second linkage moieties per surfactant molecule is 2-10.~~

16. ~~55.~~ The method of ~~any of claims 48-54~~ claim 14 or claim 15 wherein the surfactant molecules are cross-linked via cross-links, and where the average length of the cross-links is 1-100 nm.

17. ~~56.~~ The method of any of claims ~~48-55~~ 14-16 wherein the dispersed phase is an aqueous phase ~~and~~ , the continuous phase is a fluorinated oil, and the surfactant comprises a flurosurfactant.

~~57. The method of claim 56 wherein the oil is a fluorinated oil.~~

~~58. The method of any of claims 48-57 wherein the surfactant comprises a fluorosurfactant.~~

~~59. The method of any of claims 48-58 wherein the surfactant molecules are cross-linked by noncovalent bonds.~~

~~60. The method of any of claims 48-58 wherein the surfactant molecules are cross-linked by covalent bonds.~~

18. ~~61.~~ The method of ~~claim 59~~ any of claims 14-17 wherein the surfactant molecules are cross-linked by biotin-biotin binding moiety interactions, wherein the biotin-binding moieties comprise streptavidin or a streptavidin derivative.

~~62. The method of claim 61 wherein the biotin-binding moieties comprise streptavidin or a streptavidin derivative.~~

19. ~~63.~~ The method of claim 18~~61~~ wherein the surfactant molecules comprise an average of 2-10 biotin moieties per surfactant molecule.

~~64. The method of any of claims 48-63 further comprising forming the cross-linked network of surfactant molecules in the partitions.~~

~~65. The method of any of claims 48-64 wherein the cross-linked network of surfactant molecules has been formed by contacting continuous phase comprising a plurality of surfactant molecules that comprise at least one linkage moiety with a dispersed phase under conditions wherein the dispersed phase forms a plurality of partitions in the continuous phase, and providing conditions during and/or after the formation of the partitions that initiate and/or promote formation of cross-links comprising the linkage moieties, wherein the linkage moieties form cross-links from one surfactant molecule to at least one other surfactant molecule, to form a cross-linked network of surfactant molecules.~~

~~66. The method of claim 65 wherein dispersed phase comprises one or more components that initiate and/or promote formation of cross-links comprising the linkage moieties when in contact with the linkage moieties.~~

~~67. The method of claim 65 wherein the partitions are exposed to an external stimulus that initiates and/or promotes formation of cross-links comprising the linkage moieties.~~

~~68. The method of any of claims 48-67 wherein the process comprises chemical analysis; protein or strain engineering; nucleic acid, protein, or cell-based assays; sorting; separations; or chemical and/or biochemical synthesis; or a combination thereof.~~

~~69. The method of claim 68 wherein the process comprises a nucleic acid assay.~~

~~70. The method of claim 69 wherein the process comprises polymerase chain reaction (PCR).~~

~~71. The method of any of claims 48-70 wherein the cross-linked network of surfactant molecules increases the stability of the partitions in the emulsion, compared to the same emulsion without a cross-linked surfactant network, as measured by a decrease in dye diffusion of at least 20% in a dye diffusion test.~~

~~72. The method of any of claims 48-71wherein the cross-linked network of surfactant molecules increases the stability of the partitions in the emulsion, compared to the same emulsion without a cross-linked surfactant network, as measured by a PCR test, of at least 20%.~~

20. ~~73.~~ A method for producing an emulsion of partitions of dispersed phase in continuous phase, wherein the partitions of the dispersed phase comprise a plurality of surfactant molecules comprising a tail portion and a head portion that are situated at an interface of the partitions with the continuous phase to form a layer of surfactant molecules, comprising

(i) contacting continuous phase with a dispersed phase, wherein either

(a) the continuous phase comprises a plurality of surfactant molecules that comprise at least one linkage moiety, or

(b) the dispersed phase comprises a plurality of surfactant molecules that comprise at least one linkage moiety, or

(c) both (a) and (b)

under conditions wherein the dispersed phase forms a plurality of partitions in the continuous phase; and

(ii) providing conditions during and/or after the formation of the partitions that initiate and/or promote formation of cross-links between surfactant molecules comprising the linkage moieties, to form a cross-linked network of surfactant molecules.

21. ~~74.~~The method of claim ~~73~~20 wherein the continuous phase comprises surfactant molecules comprising linkage moieties and the dispersed phase does not.

~~75. The method of claim 73 or 74 wherein the linkage moieties and other components of the cross-links, if present, form cross-links that have a length that is 5-500% of the length of the tail portion of the surfactant.~~

~~76. The method of any of claims 73-75 wherein the surfactant molecules comprise an average of 2-10 linkage moieties per surfactant molecule.~~

22. ~~77.~~ The method of ~~any of claims 73-76~~ claim 20 or claim 21 wherein the conditions and/or number of linkage moieties are such that the degree of completion of the cross-linked network of surfactant molecules is 20-100%.

~~78. The method of any of claims 73-77 wherein the linkage moieties are attached to the tail portions of the surfactant molecules and the cross-links form between the tail portions of the surfactant molecules.~~

~~79. The method of any of claims 73-77 wherein the linkage moieties are attached to the head portions of the surfactant molecules and the cross-links form between the head portions of the surfactant molecules.~~

~~80. The method of any of claims 73-79 wherein dispersed phase comprises one or more components that initiate and/or promote formation of cross-links comprising the linkage moieties when in contact with the linkage moieties.~~

~~81. The method of claim 60 wherein the one or more components comprise one or more intermediate linkage moieties that form one or more bonds with the surfactant linkage moieties.~~

~~82. The method of claim 81 wherein the surfactant linkage moieties comprise biotin and the intermediate linkage moieties comprise biotin-binding moieties.~~

~~83. The method of claim 82 wherein the biotin-binding moieties comprise streptavidin and/or streptavidin derivatives.~~

~~84. The method of any of claims 73-83 wherein the partitions are exposed to an external stimulus that initiates and/or promotes formation of cross-links comprising the linkage moieties.~~

~~85. The method of claim 84 wherein the external stimulus comprises light.~~

~~86. The method of any of claims 73-85 wherein the continuous phase comprise an oil and the dispersed phase comprises an aqueous phase.~~

~~87. The method of claim 86 wherein the oil comprises a fluorinated oil.~~

~~88. The method of any of claims 73-87 wherein the surfactant comprises a fluorosurfactant.~~

~~89. The method of any of claims 73-88 wherein the cross-linked network of surfactant molecules increases the stability of the partitions in the emulsion, compared to the same emulsion without a cross-linked surfactant network, as measured by a decrease in dye diffusion of at least 20% in a dye diffusion test.~~

~~90. The method of any of claims 73-89 wherein the cross-linked network of surfactant molecules increases the stability of the partitions in the emulsion, compared to the same emulsion without a cross-linked surfactant network, as measured by a PCR test of at least 20%.~~

~~91. A method of preparing an emulsion comprising a plurality of partitions of dispersed aqueous phase in an oil continuous phase, wherein the partitions further comprise a cross-linked network of surfactant molecules at the surface of the partitions, comprising preparing an aqueous phase to be dispersed, preparing an oil phase comprising modified surfactant, wherein the modified surfactant comprises a tail portion and a head portion and further comprises linkage moieties; and mixing the aqueous phase and the oil phase to form an emulsion of a plurality of partitions of the aqueous phase in the oil, wherein the modified surfactant molecules form cross-links with each other to form a cross-linked network of surfactant molecules at the interface of the partitions with the continuous phase.~~

~~92. The method of claim 91 wherein the mixing is done in bulk by vortexing, pipetting, syringing, shaking.~~

~~93. The method of claim 91 wherein the mixing is by a microfluidic droplet forming device.~~

~~94. The method of claim 93 wherein the mixing is by a microfluidic T-junction, flow focusing junction, reverse-y junction, millipede junction or a combination thereof.~~

~~95. The method of any of claims 91-94 wherein a system for producing the emulsion is embedded within a larger instrument.~~

~~96. The method of claim 95 wherein the instrument is an instrument containing a sample delivery module, a droplet generator module, a thermal cycler module, a detection module, a waste management module, or a combination thereof.~~

97. The method of claim 95 wherein the larger instrument has microfluidic devices, tubing, containers or vats embedded.

98. The method of claim 95 wherein the instrument comprises associated software that controls the instrument including but not limited to the performance of the instrument as a whole or the microfluidic device.

99. A method for preventing coalescence of partitions in an emulsion comprising partitions of dispersed phase in a continuous phase, comprising forming a cross-linked network of surfactant molecules at interfaces between the partitions and the continuous phase.

100. The method of claim 99 wherein the partitions have an average diameter of greater than 1, 5, 10, 20, 30, 40, 50, 60, 70, or 80um, such as greater than 10 um, in diameter.

101. The method of claim 98 or 99 wherein the emulsion is at a temperature greater than 30, 40, 45. 50, 55, 60, 70, 80, or 90 ºC, such as greater than 70 ºC.

102. A method for transporting, thermal cycling, incubating, sorting, or analyzing an emulsion comprising partitions of dispersed phase in a continuous phase in a microfluidic device, wherein the droplets comprising a network of cross-linked surfactant molecules at the interface of the partitions and the continuous phase.

103. A method of performing PCR in partitions of an emulsion comprising partitions of aqueous phase in a continuous phase, wherein the partitions comprise cross-linker, polymerase, nucleotides, template DNA, primers, and probes/or DNA binding dyes, and the continuous phase comprises surfactant molecules comprising one or more linkage moieties.

104. A method comprising
(i) forming an emulsion comprising a plurality of partitions comprising dispersed phase, in a continuous phase, wherein the partitions comprise a surfactant layer comprising a plurality of surfactant molecules at an interface with the continuous phase;

(ii) cross-linking surfactant molecules at the interface to form a cross-linked surfactant network;
(iii) performing a process on the partitions; and
(iv) treating the cross-linked surfactant network to decrease a degree of cross-linking.

105. The method of claim 104 further comprising breaking open a plurality of the partitions to release dispersed phase in the partitions.

106. The method of claim 104 or 105 wherein the surfactants comprise fluorosurfactants and the continuous phase comprises a fluorinated oil.

107. The method of any of claims 104-106 wherein the process comprises a polymerase chain reaction.

108. A composition comprising a continuous phase wherein the continuous phase comprises a plurality of surfactant molecules that comprise linkage moieties attached to the surfactant molecules, wherein the moieties form cross-links with each other under suitable conditions.

109. The composition of claim 108 wherein the continuous phase is to be used in the preparation of an emulsion

110. The composition of claim 108 or 109 wherein the moieties do not substantially interact to cross-link in the continuous phase.

111. The composition of any of claims 108-110 wherein the moieties form non-covalent cross-links under suitable conditions.

112. The composition of any of claims 108-111 wherein the moieties form covalent cross-links under suitable conditions.

~~113. The composition of any of claims 108-112 wherein the continuous phase comprises an oil.~~

~~114. The composition of claim 113 wherein the oil is a fluorinated oil.~~

~~115. The composition of claim 114 wherein the fluorinated oil is (3-ethoxy-1,1,1,2,3,4,4,5,5,6,6,6-dodecafluoro-2-trifluoromethyle-hexane), methyl nonafluorobutyl ether, methyl nonafluoroisobutyl ether, ethyl nonafluoroisobutyl ether, ethyl nonofluorobutul ether, (pentane, 1,1,1,2,2,3,4,5,5,5-decafluoro-3-methoxy-4-(trifluoromethyl-)), isopropyl alcohol, (1,2-trans-dicholorethylene), (butane,1,1,1,2,2,3,3,4,4-nonafluoro-4-methoxy-), (1,1,1,2,2,4,5,5,5-nonafluoro-4-(trifluoromethyl)-3-pentanone), (furan,2,3,3,4,4-pentafluorotetrahydro-5-methoxy-2,5-bis[1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethyl]-), perfluoro compounds comprising between 5 and 18 carbon atoms, polychlorotrifluoroethylene, (2,2,2-trifluoroethanol), Novec 8200™, Novec 71DE™, Novec 7100™, Novec 7200DL™, Novec 7300DL™, Novec 71IPA™, Novec 72FL™, Novec 7500™, Novec 71DA™, Novec 7100DL™, Novec 7000™, Novec 7200™, Novec 7300™, Novec 72DA™, Novec 72DE™, Novec 649™, Novec 73DE™, Novec 7700™, Novec 612™, FC-40™, FC-43™, FC-70™, FC-72™, FC-770™, FC-3283™, FC-3284™, PF-5056™, PF-5058™, Halocarbon 0.8™, Halocarbon 1.8™, Halocarbon 4.2™, Halocarbon 6.3™, Halocarbon 27™, Halocarbon 56™, Halocarbon 95™, Halocarbon 200™, Halocarbon 400™, Halocarbon 700™, Halocarbon 1000N™, Uniflor 4622R™, Uniflor 8172™, Uniflor 8472CP™, Uniflor 8512S™, Uniflor 8731™, Uniflor 8917™, Uniflor 8951™, TRIFLUNOX 3005™, TRIFLUNOX 3007™, TRIFLUNOX 3015™, TRIFLUNOX 3032™, TRIFLUNOX 3068™, TRIFLUNOX 3150™, TRIFLUNOX 3220™, or TRIFLUNOX 3460™or a combination thereof.~~

~~116. The composition of claim 114 wherein the fluorinated oil comprises (3-ethoxy-1,1,1,2,3,4,4,5,5,6,6,6-dodecafluoro-2-trifluoromethyle-hexane); (furan,2,3,3,4,4-pentafluorotetrahydro-5-methoxy-2,5-bis[1,2,2,2-tetrafluoro-1-(trifluoromethyl)ethyl]-); perfluoro compounds comprising between 5 and 18 carbon atoms; or a combination thereof.~~

~~117. The composition of any of claims 108-116 wherein the surfactants comprise fluorosurfactants.~~

~~118. The composition of claim 117 wherein the fluorosurfactant comprises fluorosurfactants having head and tail moieties linked by ether, amide, or carbamide bonds; fluorosurfactants having a polyethylene moiety linked to a fluorocarbon moiety through a carbamide, ether, or amide bond, or a combination thereof.~~

~~119. The composition of claim 117 wherein the fluorosurfactant comprises a polyethylene moiety linked to a fluorocarbon moiety with a carbamide, amide, or ether bond.~~

~~120. The composition of any of claims 108-119 wherein the cross-links formed under suitable conditions comprise direct cross-links.~~

~~121. The composition of any of claims 108-119 wherein the cross-links formed under suitable conditions comprise indirect cross-links.~~

~~122. The composition of claim 121 wherein the linkage moieties comprise biotin.~~

~~123. The composition of any of claims 108-122 wherein each surfactant molecule comprises an average of at least 2 linkage moieties.~~

~~124. The composition of any of claims 108-122 wherein each surfactant molecule comprises an average of at least 4 linkage moieties.~~

~~125. The composition of any of claims 108-124 wherein the linkage moieties of the surfactant molecules are such that when they react under suitable conditions, the resulting cross-link between surfactant molecules is 1-100 nm.~~

126. The composition of any of claims 108-125 wherein the cross-link that forms under suitable conditions between linkage moieties has a bond strength of between 20 and 200 kJ/mole.

127. The composition of any of claims any of claims 108-126 wherein the concentration of surfactant molecules in the continuous phase is 0.5% to 2% w/v.

128. A composition comprising a dispersed phase for use in formation of an emulsion of partitions of the dispersed phase in a continuous phase wherein the partition interface with the continuous phase in the emulsion comprises a plurality of surfactant molecules comprising cross-linking moieties, wherein the dispersed phase comprises one or more components that initiate and/or promote a cross-linking process between the cross-linking moieties under suitable conditions.

129. The composition of claim 128 wherein the dispersed phase is not in contact with a continuous phase.

130. The composition of claim 128 or 129 wherein the dispersed phase comprises an aqueous phase.

131. The composition of any of claims 128-130 wherein the dispersed phase further comprises one or more additional components that initiate and/or promote a non-cross-linking process under suitable conditions.

132. The composition of claim 131 wherein the non-cross-linking process comprises a chemical reaction.

133. The composition of claim 132 wherein the components comprise nucleic acids and components for conducting polymerase chain reaction.

~~134. The composition of any of claims 128-133 wherein the cross-linking process comprises a covalent interaction.~~

~~135. The composition of any of claim 128-134 wherein the cross-linking process comprises a non-covalent process.~~

~~136. The composition of any of claims 128-135 wherein the cross-linking process comprises linking linkage moieties of the surfactant molecules through one or more intermediate linker moieties, and wherein the dispersed phase further comprises a plurality of the intermediate linker moieties.~~

~~137. The composition of claim 136 wherein the intermediate linker moiety comprises a biotin-binding moiety.~~

~~138. The composition of claim 137 wherein the biotin-binding moiety comprises avidin, streptavidin, a streptavidin derivative, or a combination thereof.~~

~~139. The composition of any of claims 128-138 wherein the concentration of the one or more components is 10 nanomolar to 10 millimolar for each component.~~

~~140. A emulsion composition comprising a plurality of partitions of a dispersed phase in a continuous phase, wherein~~
~~(i) interfaces between the dispersed phase partitions and the continuous phase comprises a plurality of surfactant molecules;~~
~~(ii) the surfactant molecules of the interfaces are cross-linked by one or more linkage moieties between surfactant molecules;~~
~~(iii) at least a portion of the partitions contain first components that, under suitable conditions, undergo a process to produce second components; and~~
~~(iv) the continuous phase comprises reporter moieties that interact with the second components to produce a signal indicating the presence and/or abundance of the second components.~~

141. The composition of claim 140 wherein the first and second components are the same or nearly the same.

142. The composition of claim 140 or 141 wherein the first component is a nucleic acid of interest and the second component is a product of amplification of the nucleic acid.

143. The composition of any of claims 140-142 wherein the linkage moieties have one or more properties that promote entrance of the reporter molecule into the partitions.

144. A method of performing an emulsion flow process comprising

(i) providing a continuous phase comprising

(a) a continuous phase, and

(b) surfactant molecules with linkage moieties

(ii) providing a dispersed phase, separate from the continuous phase, that does not comprise surfactant molecules with linkage moieties, and that comprises one or more components that initiate and/or promote formation of cross-links between surfactant molecules, wherein the cross-links comprise the linkage moieties;

(iii) flowing the continuous phase and the dispersed phase into a partition generator that generates an emulsion of a plurality of partitions comprising the dispersed phase in the continuous phase, and

(iv) during and/or after partition formation, forming cross-links between surfactant molecules that comprise the linkage moiety to form a cross-linked network of surfactant molecules at the interface of the partitions with continuous phase; and

(iii) flowing the emulsion through a process system that performs one or more operations on the partitions of the emulsion.

145. A composition comprising a plurality of first surfactant molecules comprising a tail portion and a head portion, wherein the first surfactant molecule comprises a first linkage moietiy attached to the first surfactant molecule, wherein the first linkage moiety is

~~configured to participate in formation of cross-links between the first surfactant molecule and a second surfactant comprising a second linkage moiety under suitable conditions.~~

~~146. The composition of claim 145 wherein the first and second linkage moieties have the same structure.~~

~~147. The composition of claim 145 or 146 wherein the first surfactant molecule comprises a plurality of linkage moieties.~~

~~148. The composition of claim 147 wherein the first surfactant molecule is attached to an average of 2-10 linkage moieties.~~

~~149. The composition of any of claims 145-148 wherein the first linkage moiety is attached to the tail portion of the surfactant molecule.~~

~~150. The composition of any of claims 145-148 wherein the first linkage moiety is attached to the head portion of the surfactant molecule.~~

~~151. The composition of claim any of claims 145-150 wherein the length of the first linkage moiety is 5-500% of the length of the head portion of the surfactant molecule.~~

~~152. The composition of any of claims 145-151 wherein the first surfactant molecule is a nonionic, anionic, cationic, or zwitterionic surfactant.~~

~~153. The composition any of claims 145-151 wherein the first surfactant molecule is a fluorosurfactant.~~

~~154. The composition of any of claims 145-153 wherein the linkage moiety is covalently attached to the surfactant molecule.~~

~~155. The composition of any of claims 145-154 wherein the linkage moiety is configured to bind to an intermediate moiety under suitable conditions and not to another linkage moiety.~~

~~156. The composition of claim 155 wherein the linkage moiety comprises biotin.~~

~~157. The composition of claim 155 wherein the intermediate moiety comprises a biotin-binding moiety.~~

~~158. The composition of any of claims 145-157 wherein the plurality of first surfactant molecules is contained in a continuous phase.~~

~~159. A method of modifying a first surfactant molecule comprising a tail portion and a head portion, comprising attaching a plurality of first linkage moieties to the first surfactant molecule, wherein the first linkage moiety is configured to participate in formation of cross-links between the first surfactant molecule and a second surfactant molecule comprising a second linkage moiety under suitable conditions.~~

~~160. The method of claim 159 comprising attaching an average of 2-10 of the first linkage moiety to the first surfactant molecule.~~

~~161. The method of claim 159 or 160 comprising attaching the plurality of first linkage moieties to the tail portion of the surfactant molecule.~~

~~162. The method of claim 159 or 160 comprising attaching the plurality of first linkage moieties to the head portion of the surfactant molecule.~~

~~163. The method of any of claims 159-162 wherein the length of the first linkage moiety is 5-500% of the length of the head portion of the surfactant molecule.~~

~~164. The method of any of claims 159-163 wherein the first surfactant molecule is a nonionic, anionic, cationic, or zwitterionic surfactant.~~

~~165. The method of any of claims 159-163 wherein the first surfactant molecule is a fluorosurfactant.~~

~~166. The method of any of claims 159-165 comprising covalently attaching the linkage moiety to the first surfactant molecule.~~

~~167. The method of any of claims 159-166 wherein the linkage moiety is configured to bind to an intermediate moiety under suitable conditions and not to another linkage moiety.~~

~~168. The method of claim 167 wherein the linkage moiety comprises biotin.~~

~~169. The method of claim 168 wherein the intermediate moiety comprises a biotin-binding moiety.~~

~~170. A kit comprising~~
~~(i) a container comprising a plurality of surfactant molecules for use in forming an emulsion, wherein the surfactant molecules comprise a plurality of linkage moieties for cross-linking to other surfactant molecules;~~
~~(ii) packaging that contains the container of (i).~~