WHAT IS CLAIMED IS:

1. A nanoparticle-based clathrate, comprising:

a solid guest particle, and

a host compound comprising a native polysaccharide that is amylose, a modified polysaccharide that is maltodextrin, a, cavitand that is cyclodextrin, calixarene or cucurbituril, a simple sugar that is dextrose, fructose or glucose, or a simple polyol that is ethylene glycol, propylene glycol, glycerin, sorbitol, or xylitol mixed in an acid medium to form a gel,

wherein the acid medium is polyphosphoric acid, sulfuric acid, or a solution of glyoxylic acid.

2. The nanoparticle-based clathrate of claim 1 wherein the solid guest particle is a pigment, a dye, a colorant, a pharmaceutical composition, a chemical, a metal, a metal ion, a chemical indicator, a biological indicator, a biological sensor, or a biological analyte.

3. A colloidal dispersion of nanoparticle-based clathrates according to claim 1.

4. A process for forming nanoparticles, comprising:

heating an acid medium with agitation,

adding a host vessel comprising a native polysaccharide that is amylose, a modified polysaccharide that is maltodextrin, a, cavitand that is cyclodextrin, calixarene or cucurbituril, a simple sugar that is dextrose, fructose or glucose, or a simple polyol that is ethylene glycol, propylene glycol, glycerin, sorbitol or xylitol, with agitation, to the acid medium to form a gel,

adding a solid guest particle, with agitation, to the gel to form a mixture,

stirring the mixture at an elevated temperature for a set time for particle size reduction and annealing, and

quenching the mixture,

wherein the acid medium comprises a polyphosphoric acid, sulfuric acid or glyoxylic acid, and the mixture is quenched by water.

5. The process of claim 4, wherein the temperatures under which the process is conducted range from 40 to 100° C.

6. The process of claim 4, wherein the quenching water further comprises a stabilizing compound, an acid neutralizing compound, or combinations thereof.

7. The process of claim 4, further comprising the step of separating unreacted host vessel molecules from the mixture to obtain a stabilized colloidal dispersion of the solid guest particle within the gel.

8. The process of claim 4, wherein the modified polysaccharide is maltodextrin, and wherein the solid guest particle is a pigment.

9. The process of claim 8, wherein the pigment comprises Pigment Red 122, Magenta D 4500 J, Pigment Blue 15, Pigment Green 7, Pigment Green 36, Pigment Yellow 74, or Pigment Yellow 180.

10. A process for generating a stable colloidal dispersion of nanoparticles, useful for jetting, comprising:

heating an acid solution with agitation,

adding a host vessel molecule comprising a native polysaccharide that is amylose, a modified polysaccharide that is maltodextrin , a cavitand that is cyclodextrin, calixarene or cucurbituril, a simple sugar that is dextrose, fructose or glucose, or a simple polyol that is ethylene glycol, propylene glycol, glycerin, sorbitol or xylitol to the acid solution with agitation to form a gel,

adding a solid guest particle to the gel at temperature ranging between 40° C and 100° C, with agitation, to form a mixture,

stirring the mixture at a set temperature for a set time for particle size reduction and annealing,

quenching the mixture, and

separating the unreacted host vessel component from the mixture to obtain a stabilized colloidal dispersion of nanoparticles within the gel.

11. The process of claim 10, wherein the acid solution is polyphosphoric acid, sulfuric acid or glyoxylic acid, and wherein the solid guest particle is a pigment.

12. The process of claim 11, wherein the acid solution is glyoxylic acid (50% aq.), wherein the cavitand is cyclodextrin, and wherein the pigment is Pigment Yellow 180, Pigment Yellow 120, or Pigment Red 177.

13. The process of claim 10, wherein the acid solution is glyoxylic acid (50% aq.), wherein the cavitand is cyclodextrin, and wherein the solid guest particle is carbon black.

14. A method for reducing the particle size of a solid to nanoparticle dimensions, comprising:

adding the solid as a guest particle to a structured fluid matrix of host vessel molecules formed by dispersing a native polysaccharide that is amylose, a modified polysaccharide that is maltodetxrin, a cavitand that is cyclodextrin, calixarene or cucurbituril, a simple sugar that is dextrose, fructose or glucose, or a simple polyol that is ethylene glycol, propylene glycol, glycerin, sorbitol or xylitol in an acid medium

excluding any reduction of the particle size of the solid prior to adding to the structured fluid matrix.

15. A method for preparing a stable colloidal dispersion of nanoparticles for jetting comprising the steps of:

initiating cavitation by mixing a solid guest particle in a high viscosity fluid matrix, wherein the fluid matrix is formed by dispersing a native polysaccharide that is

amylose, a modified polysaccharide that is maltodextrin, cyclodextrin or a simple sugar that is dextrose, fructose or glucose in an acid medium,

wherein after mixing, the nanoparticles are separated from the fluid matrix by membrane ultra-filtration.

16. A high viscosity structured fluid matrix useful for reducing the particle size of a guest solid, comprising host vessel molecules consisting of a native polysaccharide that is amylose, a modified polysaccharide that is maltodextrin, a cavitand that is cyclodextrin, calixarene or cucurbituril, a simple sugar that is dextrose, fructose or glucose, or a simple polyol that is ethylene glycol, propylene glycol, glycerin, sorbitol or xylitol dispersed in an acid medium that is sulfuric acid, polyphosphoric acid or glyoxylic acid to form a gel.

WHAT IS CLAIMED IS:

1. A nanoparticle-based clathrate, comprising:

a solid guest particle, and

a host compound comprising a native or modified polysaccharide, cavitand, simple sugar, simple polyol, or other similarly structured host compound mixed in an acid or other solvent medium to form a gel.

2. The nanoparticle-based clathrate of claim 1,

wherein the native polysaccharide is amylose,

wherein the modified polysaccharide is maltodextrin,

wherein the cavitand is a cyclodextrin, calixarene, or cucurbituril, and

wherein the acid medium is polyphosphoric acid, sulfuric acid, or a solution of glyoxylic acid.

3. The nanoparticle-based clathrate of claim 1 wherein the solid guest particle is a pigment, a dye, a colorant, a pharmaceutical composition, an inorganic or organic chemical composition, or a biological composition.

4. A colloidal dispersion of nanoparticle-based clathrates according to claim 1.

5. A nanoparticle formed by the process of:

heating an acid medium with agitation,

adding a host vessel comprising a native or modified polysaccharide, cavitand, simple sugar, simple polyol, or other similarly structured molecule, with agitation, to the acid medium to form a gel,

adding a solid guest particle, with agitation, to the gel to form a mixture,

stirring the mixture at an elevated temperature for a set time for particle size reduction and annealing, and

quenching the mixture.

6. The process of claim 5 wherein:

the acid medium comprises a polyphosphoric acid, sulfuric acid or glyoxylic acid,

the native polysaccharide comprises amylose,

the modified polysaccharide comprises maltodextrin,

the cavitand comprises cyclodextrin, calixarene, or cucurbituril, and

the mixture is quenched by water.

7. The process of claim 5, wherein the temperatures under which the process is conducted range from 40 to 100° C.

8. The process of claim 6, wherein the quenching water further comprises a stabilizing compound, an acid neutralizing compound, or combinations thereof.

9. The process of claim 5, further comprising the step of separating unreacted host vessel molecules from the mixture to obtain a stabilized colloidal dispersion of the solid guest particle within the gel.

10. The process of claim 6, wherein the modified polysaccharide is maltodextrin, and wherein the solid guest particle is a pigment.

11. The process of claim 10, wherein the pigment comprises Pigment Red 122, Cinquasia® Magenta D 4500 J, Solvent Blue 15, Solvent Green 7, Solvent Green 36, Pigment Yellow 74, or Pigment Yellow 180.

12. A process for generating a stable colloidal dispersion of nanoparticles, useful for jetting, comprising:

heating an acid solution with agitation,

adding a host vessel molecule comprising a native or modified polysaccharide, cavitand, simple sugar, simple polyol or other similarly structured molecule to the acid solution with agitation to form a gel,

adding a solid guest particle to the gel at temperature ranging between 40° C and 100° C, with agitation, to form a mixture,

stirring the mixture at a set temperature for a set time for particle size reduction and annealing,

quenching the mixture, and

separating the unreacted host vessel component from the mixture to obtain a stabilized colloidal dispersion of nanoparticles within the gel.

13. The process of claim 12, excluding any step for prior reduction of the particle size of the guest particle before mixing.

14. The process of claim 12, wherein the acid solution is polyphosphoric acid, sulfuric acid or glyoxylic acid, wherein the modified polysaccharide is maltodextrin, *wherein the cavitand comprises cyclodextrin, calixarene or cucurbituril, and wherein* the solid guest particle is a pigment.

15. The process of claim 14, wherein the acid solution is glyoxylic acid (50% aq.), wherein the cavitand is cyclodextrin, and wherein the pigment is Pigment Yellow 180, Pigment Yellow 120, or Pigment Red 177.

16. The process of claim 12, wherein the acid solution is glyoxylic acid (50% aq.), wherein the cavitand is cyclodextrin, and wherein the solid guest particle is carbon black.

17. A method for reducing the particle size of a solid to nanoparticle dimensions, comprising:

adding the solid as a guest particle to a structured fluid matrix of host vessel molecules formed by dispersing a native or modified polysaccharide, cavitand, simple sugar, simple polyol, or other similarly structured molecules, in an acid medium, and

excluding any reduction of the particle size of the solid prior to adding to the structured fluid matrix,

wherein the particle size achieved by the solid is limited by the structural constraints of the gel and is in nanoparticle dimensions.

18. A method for preparing a stable colloidal dispersion of nanoparticles for jetting comprising the steps of:

initiating cavitation of a solid guest particle in a high viscosity fluid matrix formed by dispersing a modified polysaccharide, cavitand, simple sugar, simple polyol or other similarly structured molecules in an acid medium, wherein a colloidal dispersion of nanoparticles results, and

stabilizing the resulting colloidal dispersion by caramelizing cyclodextrins, polysaccharides, or other carbohydrates onto the surface of the nanoparticles.

19. A high viscosity structured fluid matrix useful for reducing the particle size of a guest solid, comprising host vessel molecules selected from the group of native or modified polysaccharides, cavitands, simple sugars, simple polyols, other similarly structured molecules, and mixtures thereof, dispersed in an acid medium to form a gel,

wherein the particle size of the solid is reduced or limited upon incorporation into the gel.

for example by attaching charged groups that increase the zeta potential of the nanoparticles.

[0028] In yet a further embodiment, the invention is a distinctive process technology useful to prepare dispersions for jetting and other stable colloidal dispersions of nanoparticles, by initiating cavitation to reduce the size of solid guest particles in a high viscosity structured fluid.

[0029] The structured fluids of the invention are prepared by mixing components that are easily removed by membrane filtration. These components include, but are not limited to cavitands, modified polysaccharides, native polysaccharides, simple sugars, such as dextrose, fructose or glucose, simple polyols, such as ethylene glycol, propylene glycol, glycerin, sorbitol, xylitol and the like, *polyphosphoric acids, mixtures of two or more of these components, and* combinations of the mixture with aldehydes or polyaldehydes.

BRIEF DESCRIPTION OF THE DRAWINGS

[0030] FIG. 1 shows the helical structure of amylose from starch;

[0031] FIG. 2 is a chemical structure of β-cyclodextrin;

[0032] FIG. 2a is a schematic representing structures and dimensions for α, β, and γ -cyclodextrins; and

[0033] FIG. 3 shows a computer generated space filled model of β-cyclodextrin.

DETAILED DESCRIPTION OF THE INVENTION

[0034] Before describing the inventive compositions and processes in detail, it should be understood that the invention is not limited to the specific components, amounts of components, or applications for use set forth herein. The inventions may include other embodiments and may be practiced in various ways, as one skilled in the art would understand from the description.

[0035] Terminology used herein is not intended to be limiting. The use of "including", "containing", "constituting", "comprising" or "having" and any other variations thereof is not limited to the items recited or listed and is intended to encompass equivalents and additional items. Use of singular terms are intended to include the plural form.

[0036] Numerical ranges described herein include all values from the lowest value to the highest value.