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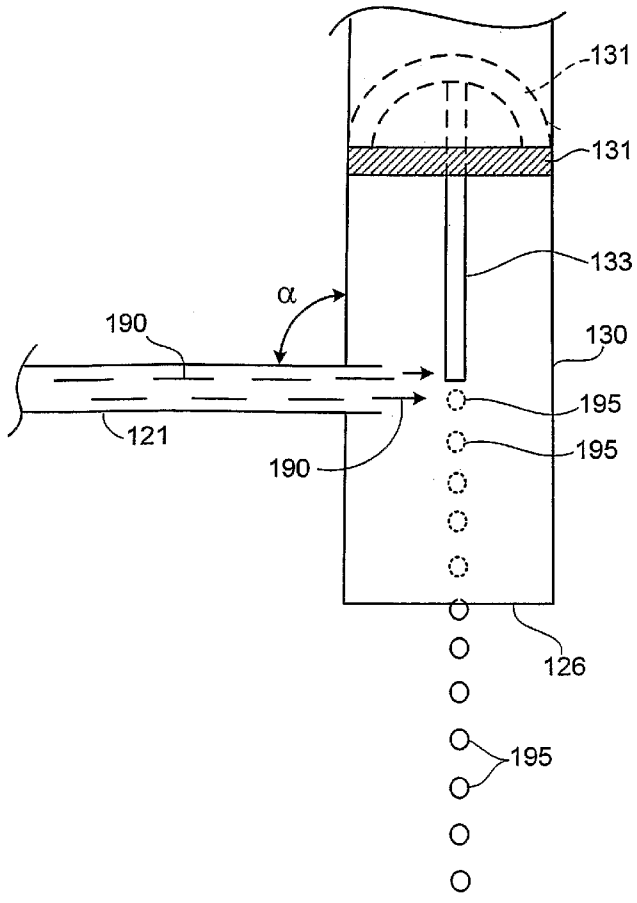
[Continued on next page]

(54) Title: PARTICLES



(57) Abstract: Particles and related methods are disclosed. In some embodiments, a method of making particles can include forming a stream of a mixture including first and second materials, exposing the stream to a vibration, and treating the stream to form particles. The vibration can have, for example, a sinusoidal, triangular, and/or sawtooth waveform.

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INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. B01J2/02 B01J2/06 B01J2/18 A61K41/00 A61K9/16
B01J13/04

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
A61K B01J

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2002/054912 A1 (KIM KYEKYOON [US] ET AL) 9 May 2002 (2002-05-09) claims 1-62; figures 4,7,8; example 1	1-14

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
25 June 2007	21/09/2007

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FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

Continuation of Box II.1

Continuation of Box II.2

Claims Nos.: 8-10

Present claims 8-10 relate to a method which has a given desired effect, namely making particles of a desired shape. However, the description does not provide support and disclosure in the sense of Article 6 and 5 PCT for any such method having the said effect and there is no common general knowledge of this kind available to the person skilled in the art. This non-compliance with the substantive provisions is to such an extent, that the search was performed taking into consideration the non-compliance in determining the extent of the search of the claim (PCT Guidelines 9.19 and 9.20).

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.5), should the problems which led to the Article 17(2) declaration be overcome.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2006/007110

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.: 8-10
because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 8-10
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
see FURTHER INFORMATION sheet PCT/ISA/210

3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1-14

Remark on Protest

☐ The additional search fees were accompanied by the applicant's protest.

☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-14

A method of making particles, the method comprising: forming a stream of a mixture comprising first and second materials; exposing the stream to a vibration having a waveform selected from the group consisting of sinusoidal waveforms, triangular waveforms, and sawtooth waveforms; and treating the stream to form particles.

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2. claims: 15-33

A method, comprising: forming a stream of drops at a first frequency; observing the stream of drops at a second frequency; and treating the stream of drops to form particles.

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3. claims: 34-36

A drop generator, comprising: a nozzle; a membrane; and a frequency generator comprising at least two channels, wherein the nozzle and the membrane are configured to form drops with a diameter of at most about 3,000 microns.

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4. claims: 37-44

A method, comprising: forming a stream of drops; observing the stream of drops under magnification; and treating the stream of drops to form particles having an arithmetic mean diameter of at most about 3,000 micro

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5. claims: 45-57

A method, comprising: monitoring a temperature of a mixture comprising first and second materials; forming a stream of drops from the mixture; and treating the stream of drops to form particles having an arithmetic mean diameter of at most about 3,000 microns.

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6. claim: 58

A drop generator, comprising: a vessel containing a mixture comprising first and second materials; and a temperature sensor in the vessel; a nozzle; and a membrane, wherein the nozzle and the membrane are configured to form drops with a diameter of at most about 3,000 microns

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FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

7. claims: 59-68

A method, comprising : monitoring a pressure of a gas in a vessel containing a mixture comprising first and second materials; forming a stream of drops from the mixture; and treating the stream of drops to form particles, wherein the particles have an arithmetic mean diameter of at most about 3,000 microns.

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8. claim: 69

A drop generator, comprising: a vessel containing a gas and a mixture comprising first and second materials; a pressure sensor in the vessel; a nozzle; and a membrane, wherein the nozzle and the membrane are configured to form drops with a diameter of at most about 3,000 microns.

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9. claims: 70-77

A method, comprising: forming a stream of drops from a mixture contained in a vessel and comprising first and second materials; and treating the stream of drops to form particles having a mean arithmetic diameter of at most about 3,000 microns, wherein the vessel includes a thermistor.

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10. claim: 78

A drop generator, comprising: a vessel containing a mixture comprising first and second materials; a thermistor in the vessel a nozzle; and a membrane, wherein the nozzle and the membrane are configured to form drops with a diameter of at most about 3,000 microns.

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11. claims: 79-90

A method, comprising: monitoring a pressure differential between a source containing a mixture comprising first and second materials and a vessel in fluid communication with the source; flowing the mixture from the source to the vessel; forming a stream of drops from the mixture; and treating the stream of drops to form particles.

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12. claims: 91-96

A method, comprising: forming a non-laminar stream of a mixture; flowing the non-laminar stream from a vessel to a drop generator; forming drops from the stream; and treating the drops to form particles having an arithmetic mean diameter of at most about 3,000 microns.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

13. claims: 97-115

A method of making particles, the method comprising: forming a stream of drops; and spraying the stream of drops with a first material, wherein the particles have an arithmetic mean diameter of at most about 3,000 microns.

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14. claims: 116-121

A method of making particles, the method comprising: forming a stream of drops in an atmosphere having a relative humidity of at least about 20 percent; and treating the stream of drops to form particles, wherein the particles have an arithmetic mean diameter of at most about 3,000 microns.

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15. claims: 122-129

A method of making particles, the method comprising: forming a stream of drops in an atmosphere having a pressure that is greater than one atmosphere; and treating the stream of drops to form particles, wherein the particles have an arithmetic mean diameter of at most about 3,000 microns.

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16. claims: 130-133

A method of making particles, the method comprising: forming a stream of drops from a mixture comprising a polymer; cross-linking the polymer; and after cross-linking the polymer, treating the stream of drops to form the particles.

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17. claims: 134-144

A method of making particles, the method comprising: forming a stream of drops from a mixture comprising a first polymer; cross-linking a second polymer that is in or on the drops; and after cross-linking the second polymer, treating the stream of drops to form the particles.

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18. claims: 145-149

A method of making particles, the method comprising: forming a stream of drops from a first mixture comprising a polymer and a gelling precursor; and flowing the stream of drops into a moving vessel, wherein the particles have an arithmetic mean diameter of at most about 3,000 microns.

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19. claim: 150

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

A method of making particles, the method comprising: forming a stream of drops from a mixture comprising a polymer and a gelling precursor; contacting some of the drops with a first cavity in a housing, the first cavity containing a first mixture comprising a first gelling agent; and contacting some of the drops with a second cavity in the housing, the second cavity containing a second mixture comprising a second gelling agent, wherein the particles have an arithmetic mean diameter of at most about 3,000 microns.

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20. claims: 151-152

A method of making particles, the method comprising: contacting a stream of drops comprising a polymer and a gelling precursor with a gelling agent and a cross-linking agent both contained in a vessel, wherein the particles have an arithmetic mean diameter of at most about 3,000 microns

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21. claims: 153-154

A method of making particles, the method comprising: contacting a stream of drops comprising a polymer and a gelling precursor with a gelling agent in a vessel; draining the gelling agent from the vessel; and adding a cross-linking agent into the vessel, wherein the particles have an arithmetic mean diameter of at most about 3,000 microns.

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22. claims: 155-156

A drop generator, comprising: a vessel containing a mixture comprising first and second materials; a nozzle; a membrane; a shaft connecting the vessel to the nozzle; and a heater connected to the shaft, wherein the nozzle and the membrane are configured to form drops with a diameter of at most about 3,000 microns.

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23. claims: 157-160

A method of making particles, the method comprising: forming a stream of a mixture comprising first and second materials; flowing the stream through an angle of less than 90 degrees; and treating the stream to form a plurality of particles having an arithmetic mean diameter of at most about 3,000 microns.

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24. claims: 161-164

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

A method, comprising: forming a helical stream of a mixture; flowing the helical stream from a vessel to a drop generator; forming drops from the stream; and treating the drops to form particles having an arithmetic mean diameter of at most about 3,000 microns.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/US2006/007110

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2002054912 A1	09-05-2002	US 2004022939 A1	05-02-2004