Method to improve dispersibility of a material having low solubility in water

Co-precipitates of a water insoluble food ingredient material and a hydrophilic polymer, and edible aqueous microdispersions of such co-precipitates are provided. The water insoluble food ingredient material may include rebaudioside D and the hydrophilic polymer may include carboxymethyl cellulose. Methods of making co-precipitates of a water insoluble food ingredient material and a hydrophilic polymer are provided.
INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2013/067012

A. CLASSIFICATION OF SUBJECT MATTER

IPC(8) - A23L 1/236 (2014.01)
USPC - 428/548

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)

IPC(8) - A23L 1/22, 1/236, 2/00, 2/60 (2014.01)
USPC - 428/548, 658

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

CPC - A23L 1/22008, 1/22033, 1/2366 (2014.02)

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Orbit, Google Patents, Google Scholar

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>US 20110189360 A1 (YOO et al) 04 August 2011 (04.08.2011) entire document</td>
<td>1-14, 40-43</td>
</tr>
<tr>
<td>A</td>
<td>US 20110104353 A1 (LEE) 05 May 2011 (05.05.2011) entire document</td>
<td>1-14, 40-43</td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C.

* 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 application or patent 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

"Z" document member of the same patent family

Date of the actual completion of the international search
08 April 2014

Date of mailing of the international search report
24 APR 2014

Name and mailing address of the ISA/US
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PCT OSP 571-272-7774

Form PCT/ISA/210 (second sheet) (July 2009)
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.:
   because they relate to subject matter not required to be searched by this Authority, namely:

2. ☐ Claims Nos.:
   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:

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).

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

See Extra 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 additional fees, this Authority did not invite payment of additional fees.
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, 40-43

Remark on Protest
☐ The additional search fees were accompanied by the applicant’s protest and, where applicable, the payment of a protest fee.
☐ The additional search fees were accompanied by the applicant’s protest but the applicable protest fee was not paid within the time limit specified in the invitation.
☐ No protest accompanied the payment of additional search fees.

Form PCT/ISA/210 (continuation of first sheet (2)) (July 2009)
INTERNATIONAL SEARCH REPORT

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees need to be paid.

Group I: Claims 1-14 and 40-43 are drawn to an edible aqueous microdispersion.

Group II: Claims 15-25 are drawn a method of preparing an edible composition comprising a sweetener.

Group III: Claims 26-39 are drawn to a method for forming an aqueous microdispersion.

The inventions listed as Groups I through III do not relate to a single general inventive concept under PCT Rule 13.1 because under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons:

The special technical features of Group I, an edible aqueous microdispersion comprising a co-precipitate material of a hydrophilic polymer and a low solubility food ingredient material, are not found in Groups II and III; the special technical features of Group II, an edible composition comprising a sweetener prepared by a method comprising: providing a solution of a sweetener comprising as solvent a mixture of at least water and an alcohol; providing a solution of a water-soluble hydrophilic polymer; combining the solution of the sweetener and the solution of the hydrophilic polymer to form a hydrophilic polymer and sweetener solution; allowing the sweetener to co-precipitate with the hydrophilic polymer; adding the co-precipitate to an edible composition, are not found in Groups I and III; the special technical features of Group III, a method for forming an aqueous microdispersion comprising a co-precipitate material of a hydrophilic polymer and a low solubility food ingredient material containing: providing a solution of a hydrophilic polymer; combining the solution of the low solubility food ingredient material and the solution of the hydrophilic polymer to form a hydrophilic polymer and low solubility food ingredient material solution; allowing the low solubility food ingredient material to co-precipitate with the hydrophilic polymer forming a co-precipitate material, are not found in Groups II and III.

Groups I through III share the technical features of an edible aqueous microdispersion prepared by the method of providing a solution of a low solubility food ingredient material wherein the low solubility food ingredient is rebaudioside D comprising as solvent a mixture of at least water and an alcohol; providing a solution of a water-soluble hydrophilic polymer wherein the hydrophilic polymer is carboxymethyl cellulose; combining this solution with the low solubility food ingredient material and forming a hydrophilic polymer and low solubility food ingredient material solution; and allowing the low solubility food ingredient material to co-precipitate with the hydrophilic polymer, forming a co-precipitate material wherein the co-precipitate is present in an edible aqueous micro-dispersion. However, these technical features do not represent a contribution over the prior art.

Specifically, US 2008/0227275 A1 to Prakash et al. teach an edible composition (Para. [0025]), ...sweetener composition...: Para. [0037], ...food and beverages...) prepared by the method of providing a solution of a low solubility food ingredient material wherein the low solubility food ingredient is rebaudioside D (Para. [0025]), ...preparing a premix solution comprising a sweetener composition and a binding agent in a solvent...: Para. [0026], ...the sweetener composition and binding agent may be dissolved in the same solvent or two separate solvents...: Para. [0027], ...sweetener compositions provided comprise at least one natural high-potency sweetener... rebaudioside D...: Para. [0101]) comprising as solvent a mixture of at least water and an alcohol (Para. [0026], ...the solvent is a food grade solvent... including ethanol, water, isopropanol, methanol, and mixtures thereof...); providing a solution of a water-soluble hydrophilic polymer wherein the hydrophilic polymer is carboxymethyl cellulose (Para. [0026], ...the premix solution comprises a sweetener composition and a binding agent dissolved in a solvent... the binding agent may have sufficient strength to facilitate agglomeration... carboxymethyl cellulose...the sweetener composition and binding agent may be dissolved in the same solvent or two separate solvents...),: combining the solution of the low solubility food ingredient material and the solution of the hydrophilic polymer to form a hydrophilic polymer and low solubility food ingredient material solution (Para. [0028], ...combined into a single solution...: effect complete mixing of the premix...); allowing the low solubility food ingredient material to co-precipitate with the hydrophilic polymer forming a co-precipitate material (Para. [0030], ...the premix is applied onto the fluidized carrier by spraying the premix onto the fluidized carrier to form an agglomerate...: Para. [0032], ...the premix solution may be sprayed on the fluidized carrier at any rate which is effective to produce an agglomerate having the desired particle size distribution... the agglomerate may be allowed to dry...: Para. [0035]).

Further, Prakash et al. teach an aqueous microdispersion (Para. [0019], ...the resulting product may be granular, free-flowing, non-caking, and may be readily an uniformly dispersed or dissolved in water... and wherein the co-precipitate is present in an edible aqueous micro-dispersion (Para. [0019], ...a process for preearing a sugar or a poloy co-crystallized sweetener compositions...: the process for preparing a sugar or a poloy co-crystallized sweetener composition comprise the steps of preparing a supersaturated sugar or poloy syrup, adding a predetermined amount of premix comprising a desired ratio of the sweetener composition and sugar or poloy to the syrup with vigorous mechanical agitation, removing the sugar or poloy syrup mixture from heat, and quickly cooling the sugar or poloy syrup mixture with vigorous agitation during crystallization and agglomeration. During the process the sweetener composition is incorporated as an integral part of the sugar or poloy matrix... The resulting product may be granular, free-flowing, non-caking, and may be readily and uniformly dispersed or dissolved in water).

The inventions listed in Groups I through III therefore lack unity under Rule 13 because they do not share a same or corresponding special technical feature.

<End Box III: Observations where unity of invention is lacking>