

Claims:

1. A method for the manufacture of a freeze-dried coffee powder, the method comprising:
providing a coffee extract having from 40wt% to 55wt% solids;
5 adding gas to the coffee extract in an amount of from 1NL/kg to 5NL/kg of coffee
extract, to provide a gas-containing coffee extract at above atmospheric pressure;
depressurising the gas-containing coffee extract to form a foamed coffee extract;
cooling the foamed coffee extract to below -40°C without shear, or with low shear, to
form a frozen coffee extract,
10 grinding the frozen coffee extract to a powder; and
drying the powder,
wherein the step of cooling the foamed coffee extract to below -40°C comprises:
(i) cooling the foamed coffee extract to a first temperature;
(ii) cooling the foamed coffee extract from the first temperature to a second
15 temperature lower than the first temperature; and
(iii) cooling the foamed coffee extract from the second temperature to below
-40°C,
wherein the first temperature is 1°C above a freezing point of the foamed coffee
extract and wherein the second temperature is 3°C below the freezing point,
20 wherein step (ii) has a duration of from 5 to 90 minutes, preferably 5 to 60 minutes
and more preferably 10 to 30 minutes.
2. The method according to claim 1, wherein the coffee extract:
(a) has from 40 to 45wt% solids and wherein the freezing point is from -5 to -7°C; or
25 (b) has from 45 to 50wt% solids and wherein the freezing point is from -7 to -8°C; or
(c) has from 50 to 55wt% solids and wherein the freezing point is from -8 to -10°C;
3. The method according to claim 1 or claim 2, wherein the coffee extract has from 48
to 51wt% solids.
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4. The method according to any of the preceding claims, wherein the low shear is less
than 50s⁻¹.

5. The method according to any of the preceding claims, wherein the gas is selected from nitrogen, air, argon, nitrous oxide and carbon dioxide, or a mixture of two or more thereof.
- 5 6. The method according to any of the preceding claims, wherein the coffee extract is at a pressure of at least 2 Bar before the gas is added to the coffee extract, more preferably at least 5 bar and most preferably at a pressure of from 10 to 250 Bar.
7. The method according to any of the preceding claims, wherein depressurising the
10 gas-containing coffee extract involves reducing the pressure of the coffee extract to 5 Bar or less, preferably to atmospheric pressure.
8. The method according to any of the preceding claims, wherein depressurising the gas-containing coffee extract involves spraying the gas-containing coffee extract.
- 15 9. The method according to any of the preceding claims, wherein the foamed coffee extract is at atmospheric pressure before the step of cooling and has a density of from 500 to 800g/l.
- 20 10. The method according to any of the preceding claims, wherein the mean rate of cooling in each of steps (i) and (iii) is at least -5°C per minute.
11. The method according to any of the preceding claims, wherein one or more of the cooling steps (i), (ii) and (iii) are conducted as a continuous process using a conveyor.
- 25 12. The method according to any of the preceding claims, wherein one or more of the cooling steps (i), (ii) and (iii) are conducted in a holding vessel or within a pumped cooling system.
- 30 13. A freeze-dried coffee powder for providing a coffee beverage with a crema of at least 0.25ml/g on reconstitution in water, the coffee powder comprising particles having open gas bubbles and ice-crystal voids and having a closed porosity of less than 15%, wherein the open gas bubbles and ice-crystal voids have low interconnectivity such that less than 92% intrusion is achieved under a pressure of 90psia Hg when measured by Hg porosimetry
35 where intrusion into the particles is considered to start at 2 psia.

14. The freeze-dried coffee powder of claim 13, wherein the intrusion span of the particles is at least 2, wherein the intrusion span is defined as:

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$$\frac{(the\ pressure\ required\ for\ 90\%\ intrusion) - (the\ pressure\ required\ for\ 10\%\ intrusion)}{(the\ pressure\ required\ for\ 50\%\ intrusion)}$$

when measured by Hg porosimetry where the intrusion into the particles is considered to start at 2 psia.

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15. The freeze-dried coffee powder of claim 13 or claim 14, wherein the freeze-dried coffee powder consists of soluble coffee solids and, optionally, less than 20wt% of roast and ground coffee particles and/or cocoa powder.

15 16. The freeze-dried coffee powder of any of claims 13 to 15, wherein the particles have a particle size distribution with a D10 of at least 300 microns.

17. The freeze-dried coffee powder of any of claims 13 to 16, wherein the ice crystal pores have a mean pore diameter of from 6 to 10 microns and/or wherein the gas bubbles
20 have a mean pore diameter from 10-60 microns.

18. The freeze-dried coffee powder of any of claims 13 to 17, wherein the open gas bubbles and ice-crystal voids have low interconnectivity such that less than 80% intrusion is achieved under a pressure of 40psia Hg.

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19. A freeze-dried coffee powder for providing a coffee beverage with a crema of at least 0.25ml/g on reconstitution in water, the coffee powder comprising particles having open gas bubbles and ice-crystal voids and having a closed porosity of less than 15%, wherein the open gas bubbles and ice-crystal voids have low interconnectivity such that less than 80%
30 intrusion is achieved under a pressure of 40psia Hg.