

CLAIMS

1. A reduced emulsifier or emulsifier-free chocolate composition comprising:
a continuous fat phase, said fat phase comprising a fat and optionally an emulsifier;
and
at least two particulate materials distributed throughout said fat phase;
wherein the at least two particulate materials have different D50 particle sizes to each other, said difference being a factor of 6-8.
2. A reduced emulsifier or emulsifier-free chocolate composition according to claim 1
having a solid phase volume x , and a Bingham plastic viscosity value y in Pa.s at 40°C or above,
where:
 x is from 0.4 to 0.7; and
 $y < 264x^3 - 330x^2 + 141x - 20$.
3. A reduced emulsifier or emulsifier-free chocolate composition according to claim 1 or 2,
having a maximum packing fraction that is greater than or equal to 0.72 for extrusion applications,
greater or equal to 0.63 for moulding applications, greater than or equal to 0.64 for enrobing
applications, or greater or equal to 0.66 for ice cream applications.
4. A reduced emulsifier or emulsifier-free chocolate composition according to any one of
claims 1 to 3, having a Bingham plastic viscosity value of between 0.1 and 10 Pa.s and a Bingham
yield stress of between 1 and 150 Pa, at 40°C.
5. A method of preparing a reduced emulsifier or emulsifier-free chocolate composition the
method comprising:
 - (a) providing an initial chocolate composition comprising
a continuous fat phase, said fat phase comprising a fat and optionally an emulsifier;
and
at least two particulate materials dispersed throughout the fat phase and the
emulsifier;
 - (b) optionally measuring the maximum packing fraction and viscosity of the initial
chocolate composition; and

(c) preparing a reduced emulsifier or emulsifier-free version of the initial chocolate composition by:

i. determining optimized particle packing parameters for the at least two particulate materials of the initial chocolate composition, wherein the optimized particle packing parameters are optimized such that the reduced emulsifier or emulsifier-free chocolate composition has a maximum packing fraction value that is greater than the maximum packing fraction value of the initial chocolate composition and a viscosity that is substantially identical to the viscosity of the initial chocolate composition;

ii. selecting for the reduced emulsifier or emulsifier-free chocolate composition at least two particulate materials that are identical to the at least two particulate materials of the initial chocolate composition but for having optimized the particle packing parameters; and

iii. combining the selected particulate materials with a fat phase and optionally an emulsifier that are identical to the fat phase and emulsifier of the initial chocolate composition to provide a reduced emulsifier or emulsifier-free version of the initial chocolate composition.

6. A method according to claim 5, wherein the particle packing parameters include particle size distribution, particle shape, and/or the relative amounts of the at least two particulate materials.

7. A method according to claim 5 or 6, wherein the optimized particle packing parameters are optimized such that the reduced emulsifier or emulsifier-free chocolate composition has a maximum packing fraction that is at least 1% greater than the maximum packing fraction of the initial chocolate composition.

8. A method according to any one of claims 5 to 7, wherein the optimized particle packing parameters are determined using mathematical modelling.

9. A method according to claim 8, wherein the mathematical model used is the compressible packing model described herein.

10. A reduced emulsifier or emulsifier-free chocolate composition obtained or obtainable by the method of any one claims 5-9.

11. A method, reduced emulsifier or emulsifier-free chocolate composition according to any one of the preceding claims wherein the at least two particulate materials are selected from the group consisting of sugars, cocoa solids, milk solids, bulking agents, calcium carbonate, nutritional particles, and flavorings and/or mixtures of two or more thereof.
12. A method, reduced emulsifier or emulsifier-free chocolate composition according to any one of the preceding claims, wherein the fat phase comprises cocoa butter, cocoa butter equivalents, cocoa butter alternatives, anhydrous milk fat, fractions thereof and/or mixtures of two or more thereof.
13. A method or reduced emulsifier chocolate composition according to any one of the preceding claims, wherein the emulsifier is selected from the group consisting of: lecithin, soy lecithin, polyglycerol polyricinoleate (PGPR), ammonium phosphatide (AMP), sorbitan tristearate, sucrose polyerucate, sucrose polystearate, phosphated mono-di-glycerides/diacetyl tartaric acid of mono glycerides.
14. A food product comprising a reduced emulsifier or emulsifier-free chocolate composition according to any one of claims 1-4 or 10.