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(54) **Spray-dried particle comprising sulphate**

(57) A particle comprising at least 45wt% sulphate, from 0wt% to 15wt% anionic detersive surfactant, sodium hydroxide and having a bulk density of from 350g/l to 700g/l and wherein the particle is spray-dried or flash-dried.

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Description

FIELD OF THE INVENTION

[0001] The present invention relates to a spray-dried particle comprising sulphate and a process for making the particle.

BACKGROUND OF THE INVENTION

[0002] Particulate detergent compositions comprise detersive active ingredients. Oftentimes these detersive ingredients make the particles 'sticky'. This has the effect of making the particles stick together which negatively impacts the flowability of the granular composition and can affect the dissolution in the wash liquor. Therefore, a 'bulking agent' in the form of a separate particle or powder is often added to the granular composition to counteract the stickiness and maintain good flowability.

[0003] Sulphate is often used as a bulking agent. However, upon addition to the wash liquor, sulphate rapidly sinks and forms a sediment at the bottom of the container as it has a very high bulk density. Consumers associate this sedimentation with 'poor cleaning' as they believe that the composition is not dissolving into the water and so 'not working'. Furthermore, in a fabric hand washing context, the slowly dissolving sediment makes the wash liquor feel 'gritty'. Consumers associate this with 'dirty wash water' and 'lack of cleaning'. In addition, as the slowly dissolving sulphate sediments in the wash liquor, it can trap other detergent components and so affect the overall cleaning performance.

[0004] A further problem is that the overall bulk density of the detergent composition is higher. This means that consumers tend to over- or under-dose the amount of detergent composition to add to the wash liquor.

[0005] A solution to this is to provide a spray-dried or flash-dried particle comprising sulphate. This particle has a lower bulk density than regular sulphate and so tends to sink more slowly and have a faster dissolution rate. Hence the amount of sedimentation is lower.

[0006] But, even though the amount of sedimentation is lower, the particle tends to make the wash liquor 'cloudy'. Consumers also tend to associate this with 'dirty wash water' and 'lack of cleaning'.

[0007] There is a need in the art to provide a bulking agent for granular laundry detergent compositions that provides a more consumer acceptable level of clarity to the wash liquor.

[0008] The Inventors surprisingly found that a spray-dried or flash-dried particle comprising at least 45wt% sulphate, from 0wt% to 15wt% anionic detersive surfactant, and having a bulk density of from 350g/l to 700g/l and wherein the particle comprises sodium hydroxide provided a more consumer acceptable wash liquor.

SUMMARY OF THE INVENTION

[0009] A first aspect of the present invention is to a particle comprising at least 45wt% sulphate, from 0wt% to 15wt% anionic detersive surfactant, sodium hydroxide and having a bulk density of from 350g/l to 700g/l and wherein the particle is spray-dried or flash-dried.

[0010] A second aspect of the present invention is a method of making a particle according to the first aspect.

DETAILED DESCRIPTION OF THE INVENTION

The particle

[0011] The present invention is to a particle comprising at least 45wt% sulphate, from 0wt% to 10wt% silicate, from 0wt% to 10wt% polymer and from 0wt% to 15wt% anionic detersive surfactant, sodium hydroxide and having a bulk density of from 350g/l to 700g/l wherein the particle is a spray-dried or flash-dried particle. Preferably the particle is made according to the process of the present invention.

[0012] The sulphate is described in more detail below. The particle may comprise at least 55wt%, or even 65wt% or even 75wt% sulphate. The particle may comprise at most 99wt% sulphate, or even 90wt%, or even 85wt% or even 80wt% sulphate.

[0013] The particle comprises sodium hydroxide. The particle may comprise between 0.1wt% and 5wt%, or even between 0.25wt% and 5wt% or even between 0.5wt% and 5wt%, or even between 0.5wt% and 3.5wt% sodium hydroxide. Without wishing to be bound by theory, it is believed that the presence of the sodium hydroxide results in a more consumer acceptable level of clarity of the wash liquor. Furthermore, without wishing to be bound by theory, the presence of sodium hydroxide allows for lower polymer levels in the particle. Polymers, preferably polycarboxylate polymers, are added to provide good flowability of the particles. However, the use of such polymers is expensive. It was surprisingly found that presence of sodium hydroxide resulted in free flowing particles but at lower polymer levels.

[0014] The particle may comprise carbonate. If carbonate is present in the particle, it may be present at a concentration of between 0wt% and 30wt%, or at most 20wt%, or even at most 10wt%. Carbonate may be present in the particle at a concentration of at least 1wt%, or even 2wt%, or even 5wt% or even 10wt%, or even 15wt%.

[0015] The particle may comprise from 0 to 10wt% polymer. Suitable polymers are described in more detail below. The polymer in the particle can be selected from a polycarboxylate homopolymer or a polycarboxylate copolymer, preferably the polymer is selected from polyacrylate homopolymer or acrylic acid/maleic acid copolymer.

[0016] Suitable anionic detersive surfactants are described in more detail below. The anionic detersive surfactant in the particle can be linear alkylbenzene sulfonate. Or the anionic detersive surfactant in the particle can be alkyl ethoxylated sulphate

[0017] The particle may comprise from 0 to 10wt% silicate.

[0018] The particle may have a mean particle size of between 350 and 500μm, preferably 375-425μm.

[0019] Without wishing to be bound by theory, the density of the particle means that it floats in the wash liquor and exhibits reduced sedimentation. The density of the particle is lower than traditionally used sulphate particles. This is preferably achieved by spray-drying or flash-drying the particle. During the spray-drying or flash-drying process, preferably air is injected into the aqueous slurry which is then spray-dried or flash-dried to produce the particle. This results in 'air bubbles' in the particle. This increased porosity means that the particle has a higher surface area, and so the particle dissolves faster in the wash liquor. This faster dissolution and lower level of sedimentation means that the wash liquor does not have the same gritty feel as if traditional sulphate particles were used. However, the particle still acts as a bulking agent ensuring excellent flowbability of the powder composition.

[0020] The particle may be a spray-dried particle, a flash-dried particle, an agglomerate particle, or an extrudate. Preferably, the particle is a spray-dried particle.

[0021] The bulk density of the particle can be from 350g/l to 600g/l, or from 400g/l to 550g/l.

Sulphate

[0022] The sulphate in the particle can be any suitable sulphate.

Polymer

[0023] The polymer can be any suitable polymer.

[0024] Suitable polymers include carboxylate polymers, such as polyacrylates, and acrylate/maleate co-polymers and other functionalized polymers such as styrene acrylates. Preferably, the carboxylate polymer is an acrylate/maleate copolymer having an average molecular weight of about 2,000 to about 100,000 and a ratio of acrylate to maleate segments of from about 30:1 to about 1:1.

[0025] One suitable polymer is an amphiphilic graft polymer (AGP). Suitable AGPs are obtainable by grafting a polyalkylene oxide of number average molecular weight from about 2,000 to about 100,000 with vinyl acetate, which may be partially saponified, in a weight ratio of polyalkylene oxide to vinyl acetate of about 1:0.2 to about 1:10. The vinyl acetate may, for example, be saponified to an extent of up to 15%. The polyalkylene oxide may contain units of ethylene oxide, propylene oxide and/or butylene oxide. Selected embodiments comprise ethylene oxide.

[0026] In some embodiments the polyalkylene oxide has a number average molecular weight of from about 4,000 to about 50,000, and the weight ratio of polyalkylene oxide to vinyl acetate is from about 1:0.5 to about 1:6. A material within this definition, based on polyethylene oxide of molecular weight 6,000 (equivalent to 136 ethylene oxide units), containing approximately 3 parts by weight of vinyl acetate units per 1 part by weight of polyethylene oxide, and having itself a molecular weight of about 24,000, is commercially available from BASF as Sokalan HP22.

[0027] Suitable AGPs may be present in the detergent composition at weight percentages of from about 0 to about 5%, preferably from about above 0% to about 4%, or from about 0.5% to about 2%. In some embodiments, the AGP is present at greater than about 1.5wt%. The AGPs are found to provide excellent hydrophobic soil suspension even in the presence of cationic coacervating polymers.

[0028] Preferred AGPs are based on water-soluble polyalkylene oxides as a graft base and side chains formed by polymerization of a vinyl ester component. These polymers having an average of less than or equal to one graft site per 50 alkylene oxide units and mean molar masses (Mw) of from about 3000 to about 100,000.

[0029] Another suitable polymer is polyethylene oxide, preferably substituted or un-substituted.

[0030] Another suitable polymer is cellulosic polymer, preferably selected from alkyl cellulose, alkyl alkoxyalkyl cellulose, carboxylalkyl cellulose, alkyl carboxyalkyl, more preferably selected from carboxymethyl cellulose (CMC) including blocky CMC, methyl cellulose, methyl hydroxyethyl cellulose, methyl carboxymethyl cellulose, and mixures thereof.

[0031] Other suitable polymers are soil release polymers. Suitable polymers include polyester soil release polymers. Other suitable polymers include terephthalate polymers, polyurethanes, and mixtures thereof. The soil release polymers, such as terephthalate and polyurethane polymers can be hydrophobically modified, for example to give additional benefits

such as sudsing.

[0032] Other suitable polymers include polyamines, preferably polyethylene imine polymers, preferably having ethylene oxide and/or propylene oxide functionalized blocks

[0033] Other suitable polymers include synthetic amino containing amphoteric/and/or zwitterionic polymers, such as those derived from hexamethylene diamine.

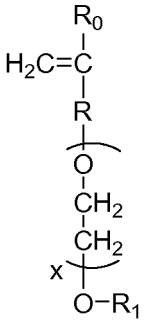
[0034] Another suitable polymer is a polymer that can be co-micellized by surfactants, such as the AGP described in more detail above.

[0035] Other suitable polymers include silicone, including amino-functionalised silicone.

[0036] Suitable polymers can include clay and soil removal/anti-redeposition agents being co-polymers comprising:

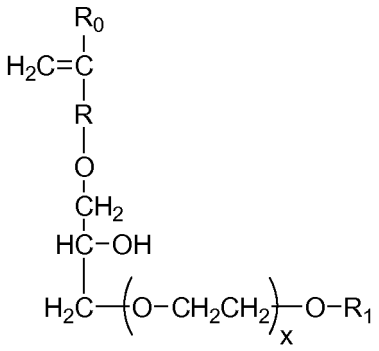
(i) from 50 to less than 98 wt% structural units derived from one or more monomers comprising carboxyl groups; (ii) from 1 to less than 49 wt% structural units derived from one or more monomers comprising sulfonate moieties; and (iii) from 1 to 49 wt% structural units derived from one or more types of monomers selected from ether bond-containing monomers represented by formulas (I) and (II):

formula (I):



wherein in formula (I), R_0 represents a hydrogen atom or CH_3 group, R represents a CH_2 group, CH_2CH_2 group or single bond, X represents a number 0-5 provided X represents a number 1-5 when R is a single bond, and R_1 is a hydrogen atom or C_1 to C_{20} organic group;

formula (II)



in formula (II), R_0 represents a hydrogen atom or CH_3 group, R represents a CH_2 group, CH_2CH_2 group or single bond, X represents a number 0-5, and R_1 is a hydrogen atom or C_1 to C_{20} organic group.

[0037] Other suitable polymers include polysaccharide polymers such as celluloses, starches, lignins, hemicellulose, and mixtures thereof.

[0038] Other suitable polymers include cationic polymers, such as deposition aid polymers, such as cationically modified cellulose such as cationic hydroxy ethylene cellulose, cationic guar gum, cationic starch, cationic acrylamides and mixtures thereof.

[0039] Mixtures of any of the above described polymers can be used herein.

Anionic detersive surfactant

[0040] The anionic detersive surfactant can be alkyl benzene sulphonic acid or salt thereof, alkyl ethoxylated sulphate, or a mixture thereof. Preferably, the anionic detersive surfactant is a mixture of alkyl benzene sulphonic acid or salt thereof and alkyl ethoxylated sulphate.

[0041] Suitable anionic detersive surfactants include sulphate and sulphonate detersive surfactants.

[0042] Preferred sulphonate detersive surfactants include alkyl benzene sulphonate, preferably C_{10-13} alkyl benzene sulphonate. Suitable alkyl benzene sulphonate (LAS) is obtainable, preferably obtained, by sulphonating commercially available linear alkyl benzene (LAB); suitable LAB includes low 2-phenyl LAB, such as those supplied by Sasol under the tradename Isochem® or those supplied by Petresa under the tradename Petrelab®, other suitable LAB include high 2-phenyl LAB, such as those supplied by Sasol under the tradename Hyblene®. A suitable anionic detersive surfactant is alkyl benzene sulphonate that is obtained by DETAL catalyzed process, although other synthesis routes, such as HF, may also be suitable.

[0043] Preferred sulphate detersive surfactants include alkyl sulphate, preferably C_{8-18} alkyl sulphate, or predominantly C_{12} alkyl sulphate.

[0044] Another preferred sulphate detersive surfactant is alkyl alkoxylated sulphate, preferably alkyl ethoxylated sulphate, preferably a C_{8-18} alkyl alkoxylated sulphate, preferably a C_{8-18} alkyl ethoxylated sulphate, preferably the alkyl alkoxylated sulphate has an average degree of alkoxylation of from 0.5 to 20, preferably from 0.5 to 10, preferably the alkyl alkoxylated sulphate is a C_{8-18} alkyl ethoxylated sulphate having an average degree of ethoxylation of from 0.5 to 10, preferably from 0.5 to 7, more preferably from 0.5 to 5 and most preferably from 0.5 to 3.

[0045] The alkyl sulphate, alkyl alkoxylated sulphate and alkyl benzene sulphonates may be linear or branched, substituted or un-substituted.

Silicate salt

[0046] A suitable silicate salt is sodium silicate, preferably 1.6R and/or 2.0R sodium silicate.

The laundry detergent powder

[0047] The present invention contemplates a laundry detergent powder comprising the particle of the present invention. The laundry detergent powder of the present invention preferably comprises from 20 to 80wt% of the particle or even from 50wt% to 80wt%, or even from 60wt% to 80wt% by weight of the laundry detergent powder.

[0048] The laundry detergent powder is suitable for any laundry detergent application, for example: laundry, including automatic washing machine laundering and hand laundering, and even bleach and laundry additives.

[0049] The laundry detergent powder can be a fully formulated detergent product, such as a fully formulated laundry detergent product, or it can be combined with other particles to form a fully formulated detergent product, such as a fully formulated laundry detergent product. The particle may be combined with other particles such as: enzyme particles; perfume particles including agglomerates or extrudates of perfume microcapsules, and perfume encapsulates such as starch encapsulated perfume accord particles; surfactant particles, such as non-ionic detersive surfactant particles including agglomerates or extrudates, anionic detersive surfactant particles including agglomerates and extrudates, and cationic detersive surfactant particles including agglomerates and extrudates; polymer particles including soil release polymer particles, cellulosic polymer particles; buffer particles including carbonate salt and/or silicate salt particles, preferably a particle comprising carbonate salt and silicate salt such as a sodium carbonate and sodium silicate co-particle, and particles and sodium bicarbonate; other spray-dried particles; fluorescent whitening particles; aesthetic particles such as coloured noodles or needles or lamellae particles; bleaching particles such as percarbonate particles, especially coated percarbonate particles, including carbonate and/or sulphate coated percarbonate, silicate coated percarbonate, borosilicate coated percarbonate, sodium perborate coated percarbonate; bleach catalyst particles, such as transition metal catalyst bleach particles, and imine bleach boosting particles; performed peracid particles; hueing dye particles; and any mixture thereof. In a preferred embodiment the laundry detergent composition also comprises a particle comprising less than 50wt% sulphate, at least 20wt% anionic detersive surfactant, from 1wt% to 5wt% polymer, from 15 to 40wt% carbonate and having a bulk density of from 300g/l to 900g/l.

[0050] It may also be especially preferred for the laundry detergent powder to comprise low levels, or even be essentially free, of builder. By essentially free of it is typically meant herein to mean: "comprises no deliberately added'. In a preferred embodiment, the laundry detergent powder comprises no builder.

[0051] The laundry detergent powder is typically flowable, typically having a cake strength of from 0 N to 20 N, preferably from 0 N to 15 N, more preferably from 0 N to 10 N, most preferably from 0 N to 5 N. The method to determine the cake strength is described in more detail elsewhere in the description.

[0052] The laundry detergent powder typically comprises from 0wt% to 7wt%, preferably from 1wt% to 5wt%, and

preferably from 2wt% to 3wt% water.

Zeolite builder

[0053] Suitable zeolite builder includes include zeolite A, zeolite P and zeolite MAP. Especially suitable is zeolite 4A.

Phosphate builder

[0054] A typical phosphate builder is sodium tri-polyphosphate.

Silicate salt

[0055] A suitable silicate salt is sodium silicate, preferably 1.6R and/or 2.0R sodium silicate.

Other detergent ingredients

[0056] The composition typically comprises other detergent ingredients. Suitable detergent ingredients include: transition metal catalysts; imine bleach boosters; enzymes such as amylases, carbohydrases, cellulases, laccases, lipases, bleaching enzymes such as oxidases and peroxidases, proteases, pectate lyases and mannanases; source of peroxygen such as percarbonate salts and/or perborate salts, preferred is sodium percarbonate, the source of peroxygen is preferably at least partially coated, preferably completely coated, by a coating ingredient such as a carbonate salt, a sulphate salt, a silicate salt, borosilicate, or mixtures, including mixed salts, thereof; bleach activator such as tetraacetyl ethylene diamine, oxybenzene sulphonate bleach activators such as nonanoyl oxybenzene sulphonate, caprolactam bleach activators, imide bleach activators such as N-nonanoyl-N-methyl acetamide, preformed peracids such as N,N-pthaloylamino peroxycaproic acid, nonylamido peroxyadipic acid or dibenzoyl peroxide; suds suppressing systems such as silicone based suds suppressors; brighteners; hueing agents; photobleach; fabric-softening agents such as clay, silicone and/or quaternary ammonium compounds; flocculants such as polyethylene oxide; dye transfer inhibitors such as polyvinylpyrrolidone, poly 4-vinylpyridine N-oxide and/or co-polymer of vinylpyrrolidone and vinylimidazole; fabric integrity components such as oligomers produced by the condensation of imidazole and epichlorhydrin; soil dispersants and soil anti-redeposition aids such as alkoxylated polyamines and ethoxylated ethyleneimine polymers; anti-redeposition components such as polyesters and/or terephthalate polymers, polyethylene glycol including polyethylene glycol substituted with vinyl alcohol and/or vinyl acetate pendant groups; perfumes such as perfume microcapsules, polymer assisted perfume delivery systems including Schiff base perfume/polymer complexes, starch encapsulated perfume accords; soap rings; aesthetic particles including coloured noodles and/or needles; dyes; fillers such as sodium sulphate, although it may be preferred for the composition to be substantially free of fillers; carbonate salt including sodium carbonate and/or sodium bicarbonate; silicate salt such as sodium silicate, including 1.6R and 2.0R sodium silicate, or sodium metasilicate; co-polyesters of di-carboxylic acids and diols; cellulosic polymers such as methyl cellulose, carboxymethyl cellulose, hydroxyethoxycellulose, or other alkyl or alkylalkoxy cellulose, and hydrophobically modified cellulose; carboxylic acid and/or salts thereof, including citric acid and/or sodium citrate; and any combination thereof.

Process to make a particle

[0057] The present invention is to a process for making a particle comprising at least 45wt% sulphate, from 0wt% to 15wt% anionic detersive surfactant, and having a bulk density of from 350g/l to 700g/l, comprising the steps of;

a) preparing an aqueous slurry comprising sulphate, sodium hydroxide and optionally detersive surfactant;
b) drying the particle;

and wherein the sulphate added to the aqueous slurry has a volume average particle size of from 10 micrometers to 50 micrometers.

[0058] The particle may comprise at least 55wt%, or even 65wt% or even 75wt% sulphate. The particle may comprise at most 99wt% sulphate, or even 90wt%, or even 85wt% or even 80wt% sulphate.

[0059] Step (a): the aqueous slurry can be formed by mixing in any suitable vessel, such as a mixer, in the standard manner. Suitable mixers include vertical mixers, slurry mixers, tank agitators, crutcher mixers and the like. Suitable sulphate, silicate, polymer, sodium hydroxide and detersive surfactant are described below. The slurry preferably comprises form 30 to 60wt% water. The slurry may comprise, silicate, polymer or a mixture thereof.

[0060] Step (b): the aqueous slurry is transferred from the mixer, preferably through at least one pump, to preferably a spray nozzle. Typically, the aqueous slurry is transferred in a pipe. The aqueous slurry is typically transferred though

an intermediate storage vessel such as a drop tank, for example when the process is semi-continuous. Alternatively, the process can be a continuous process, in which case no intermediate storage vessel is required. The aqueous slurry is transferred through at least one pump, preferably at least two, or even at least three or more pumps, although one or two, preferably two pumps may be preferred. Typically, when two or more pumps are used, the first pump is a low pressure pump, such as a pump that is capable of generating a pressure of from $3x10^5$ to $1x10^6$ Pa, and the second pump is a high pressure pump, such as a pump that is capable of generating a pressure of from $2x10^6$ to $1x10^7$ Pa. Optionally, the aqueous slurry is transferred through a disintegrator, such as disintegrators supplied by Hosakawa Micron. The disintegrator can be positioned before the pump, or after the pump. If two or more pumps are present, then the disintegrator can also be positioned between the pumps. Typically, the pumps, disintegrators, intermediate storage vessels, if present, are all in series configuration. However, some equipment may be in a parallel configuration. A suitable spray nozzle is a Spray Systems T4 Nozzle.

[0061] A gas, preferably air, can be injected into the aqueous slurry prior to spray-drying or flash-drying. The gas may be injected into the aqueous slurry between the first pump and the second pump. Without wishing to be bound by theory, by injecting air into the slurry introduces air bubbles into the slurry. When the slurry is spray-dried or flash-dried the air bubbles are incorporated into the resultant powder. This decreases the overall bulk density of the particle.

[0062] In step (b), it may be preferred that additionally sodium chloride is contacted to the aqueous slurry after the mixer and before the spray nozzle.

[0063] The aqueous slurry is sprayed through the spray nozzle into a spray-drying tower or a flash-drying tower. Preferably, the aqueous slurry is kept at a temperature of 30°C or above, or even 32°C and above. At these temperatures the sulphate remains dissolved in the slurry. Below these temperatures it comes out of the aqueous slurry. Preferably, the aqueous slurry is at a temperature of from 60°C to 130°C when it is sprayed through the spray nozzle into the spray-drying tower. Suitable spray-drying towers are co-current or counter-current spray-drying towers. The slurry is typically sprayed at a pressure of from $6x10^6$ Pa to $1x10^7$ Pa.

[0064] When added to the aqueous slurry, the sulphate has a volume average particle size of from 10 micrometers to 50 micrometers, preferably from 20 micrometers, or from 30 micrometers, and preferably to 45 micrometers, or even to 42 micrometers. The volume average particle size of the sulphate can be determined by any conventional means, such as light scattering, for example using a sympatec particle size analyser. The particle size of the inorganic salt can be controlled (i.e. reduced) by any suitable means, such as dry grinding (e.g. using pin mills) or wet grinding (e.g. using colloid mill). Without wishing to be bound by theory, smaller particle size sulphate dissolves more efficiently into the aqueous slurry. It is believed this is due to the larger surface area of the sulphate particles. This improved efficiency of dissolution has the benefit that less sulphate sediments out of the slurry during the manufacturing process. Sedimentation can cause blockages in the apparatus and so negatively affect production. Furthermore, the smaller particle size of the sulphate in the resultant spray-dried particle has the benefit of further reducing the 'gritty' feel within the wash liquor.

[0065] The slurry is dried, preferably via spray-drying to form a spray-dried powder. Preferably, the exhaust air temperature is in the range of from 60°C to 100°C.

Method for measuring cake strength

[0066] A smooth plastic cylinder of internal diameter 6.35 cm and length 15.9 cm is supported on a suitable base plate. A 0.65 cm hole is drilled through the cylinder with the centre of the hole being 9.2cm from the end opposite the base plate.

[0067] A metal pin is inserted through the hole and a smooth plastic sleeve of internal diameter 6.35cm and length 15.25 cm is placed around the inner cylinder such that the sleeve can move freely up and down the cylinder and comes to rest on the metal pin. The space inside the sleeve is then filled (without tapping or excessive vibration) with the spray-dried powder such that the spray-dried powder is level with the top of the sleeve. A lid is placed on top of the sleeve and a 5 kg weight placed on the lid. The pin is then pulled out and the spray-dried powder is allowed to compact for 2 minutes. After 2 minutes the weight is removed, the sleeve is lowered to expose the powder cake with the lid remaining on top of the powder.

[0068] A metal probe is then lowered at 54 cm/min such that it contacts the centre of the lid and breaks the cake. The maximum force required to break the cake is recorded and is the result of the test. A cake strength of 0 N refers to the situation where no cake is formed.

EXAMPLES

[0069] A comparison was made between a spray-dried powder according to the present invention and a spray-dried powder outside of the scope of the present claims.

[0070] A first detergent POWDER A was prepared, comprising 100wt% of a Spray Dried particle 1 (bulk density: 300 g/l). The spray dried particle 2 was manufactured via spray drying of an aqueous slurry composed of sodium disilicate, sodium sulphate having a particle size of between 100 and 200 microns, water, anionic surfactant and acrylate/maleate

co-polymer. The slurry was prepared in at 80°C in a crutcher making vessel and the slurry was pumped through a standard spray system pressure nozzle and atomized into a counter current spray drying tower at an air inlet temperature of 275 °C. The atomized slurry was dried to produce a solid mixture, which is was then cooled and sieved to remove oversize material (>1.8mm) to form a spray-dried powder. The composition of POWDER A is shown in Table 1.

Table 1.

Component	%w/w
Sodium silicate salt	15.00
Linear alkyl benzene sulphonate	10.05
Sodium sulphate	70.22
Water	1.0
Acrylate/maleate copolymer	3.74
Total Parts	100.0

[0071] A second detergent POWDER B was prepared comprising 100wt% of a second spray-dried particle (bulk density: 500 g/l), blended in a batch rotating mixer. The third spray dried particle was manufactured via spray drying of an aqueous slurry composed of sodium sulphate having a particle size of between 100 and 200 microns, water, anionic surfactant, acrylate/maleate co-polymer and less than 5% NaOH. The slurry was prepared in at 80°C in a crutcher making vessel and the slurry was pumped through a standard spray system pressure nozzle and atomized into a counter current spray drying tower at an air inlet temperature of 275 °C. The atomized slurry was dried to produce a solid mixture, which is was then cooled and sieved to remove oversize material (>1.8mm) to form a spray-dried powder. The composition of POWDER B is seen in Table 2.

Table 2.

Component	%w/w
NaOH	0.25%
Linear alkyl benzene sulphonate	10.01%
Sodium sulphate	84.71%
Water	1.0%
Acrylate/maleate copolymer	3.70%
Total Parts	100.0

Turbidity Test

[0072] A 8 g sample of both DETERGENT A and DETERGENT B were separately dispersed into 250 ml aliquots of fresh tap water at 20°C, stirred at 400 RPM, using a magnetic stirrer and hotplate with thermocouple. The powders were left to dissolve for 30 minutes at 20°C, and then a 25ml sample of solution was taken into a clean transparent glass vial. The solution sample was measured for Turbidity using the Merck TurbiQuant 1500IP® Turbidimeter, at room temperature. Results are presented in Nephelometry Turbidity Units (NTU), with a value of 0 NTU corresponding to a fully clear solution (e.g. water with no suspended particles), and 1000 NTU corresponding to a cloudy fully saturated suspension.

[0073] The results can be seen in Table 3.

Table 3

	Turbidity (NTU)
Powder Detergent A	78
Powder Detergent B	51.5

[0074] As can be seen from Table 3, a wash liquor comprising powder detergent B which corresponds to a laundry detergent composition according to the present invention, was less turbid than a wash liquor comprising powder detergent

A (outside of the present invention). Indeed, a wash liquor comprising detergent B was 34% less turbid that a wash liquor comprising powder detergent A.

[0075] The dimensions and values disclosed herein are not to be understood as being strictly limited to the exact numerical values recited. Instead, unless otherwise specified, each such dimension is intended to mean both the recited value and a functionally equivalent range surrounding that value. For example, a dimension disclosed as "40 mm" is intended to mean"about 40 mm."

Claims

1. A particle comprising at least 45wt% sulphate, from 0wt% to 15wt% anionic detersive surfactant, sodium hydroxide and having a bulk density of from 350g/l to 700g/l and wherein the particle is spray-dried or flash-dried.

2. The particle according to claim 1, wherein the particle comprises between 0.1wt% and 5wt%, or even between 0.25wt% and 5wt% or even between 0.5wt% and 5wt%, or even between 0.5wt% and 3.5wt% sodium hydroxide.

3. The particle according to any preceding claims, wherein the particle comprises less than 20wt%, preferably less than 15wt% carbonate.

4. The particle according to any preceding claims, wherein the particle comprises less than 15wt% silicate.

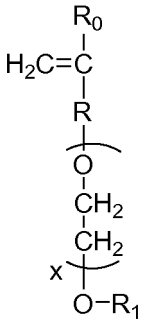
5. The particle according to any preceding claims, wherein the particle comprises at least 55wt%, preferably at least 65wt%, more preferably at least 75wt% sulphate.

6. The particle according to any preceding claims, wherein the particle comprises a polymer selected from the group consisting of:

(I) polycarboxylate homopolymers, preferably polyacrylate homopolymers;
(II) polycarboxylate co-polymers, preferably acrylic acid/maleic acid co-polymers;
(III) co-polymers comprising:

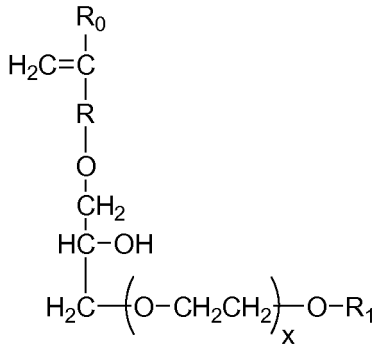
(i) from 50 to less than 98 wt% structural units derived from one or more monomers comprising carboxyl groups;
(ii) from 1 to less than 49 wt% structural units derived from one or more monomers comprising sulfonate moieties; and
(iii) from 1 to 49 wt% structural units derived from one or more types of monomers selected from ether bond-containing monomers represented by formulas (I) and (II):

formula (I):



wherein in formula (I), R_0 represents a hydrogen atom or CH_3 group, R represents a CH_2 group, CH_2CH_2 group or single bond, X represents a number 0-5 provided X represents a number 1-5 when R is a single bond, and R_1 is a hydrogen atom or C_1 to C_{20} organic group;

formula (II)



in formula (II), R_0 represents a hydrogen atom or CH_3 group, R represents a CH_2 group, CH_2CH_2 group or single bond, X represents a number 0-5, and R_1 is a hydrogen atom or C_1 to C_{20} organic group;

(IV) any combination thereof.

7. A laundry detergent composition comprising a particle according to any preceding claims.

8. A process for making a particle according to any preceding claims, comprising the steps of;

a) preparing an aqueous slurry comprising sulphate, sodium hydroxide and optionally detersive surfactant;
b) drying the particle;

and wherein the sulphate added to the aqueous slurry has a volume average particle size of from 10 micrometers to 50 micrometers.

9. The process according to claim 8, wherein the sulphate is dry ground or wet ground to achieve a volume average particle size of from 10 micrometers to 50 micrometers.

10. The process according to any preceding claims, wherein the sulphate has a volume average particle size of from 20 micrometers, or from 30 micrometers, and preferably to 45 micrometers, or even to 42 micrometers.

11. The process according to any preceding claims, wherein the particle is dried by spray-drying or flash-drying.

12. The process according to claim 8, wherein the slurry is at a temperature of above 30°C, preferably above 32°C prior to being spray-dried or flash-dried.

13. The process according to any preceding claims, wherein the slurry comprises between 30 and 60wt% water.

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EUROPEAN SEARCH REPORT

Application Number
EP 13 16 6780

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C11D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	9 October 2013	Pfannenstein, Heide

CATEGORY OF CITED DOCUMENTS

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