

FRAGRANCED COMPOSITION

This disclosure relates to the provision of fragrance in washing compositions, such as laundry detergents.

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The normal, unaltered smell of washing compositions such as laundry detergent is a "chemical" smell, which, while not bad, is also not particularly desirable. Therefore, nearly all such compositions are fragranced. Fragrances are not individual substances, but blends of perfume ingredients, sometimes 50 or more of them. They are formulated by trained, experienced

10 perfumers to obtain a desired olfactory note. The problem is that washing compositions are alkaline (in water, they generate high pHs of up to 11). Long storage of a fragranced dry washing composition can have a detrimental effect on some perfume ingredients. This is particularly true of esters, favoured perfume ingredients noted for their fruity/sweet notes. The degradation of these ingredients on storage means that, when the composition is used, the desired olfactory effect of the

15 fragrance has been substantially lost. As a result, fragrances for use in such compositions are formulated with reduced proportions of such ingredients, and even in their complete absence. As these are popular ingredients, the palette of the perfumer is greatly restricted, and therefore so is the possible fragrancing of washing compositions.

20 It is possible to encapsulate fragrances to preserve them in such environments, which is fine if fragrance release is desired to be released by rubbing the washed item, but not so fine if release is desired in the wash.

It has now been found that it is possible to provide a full fragrance palette under conditions of

25 storage with alkaline washing compositions. There is therefore provided a fragranced washing composition, comprising a washing composition base and a fragrance, in which the fragrance is present as two separate components, a first component being a liquid component and the second component a particulate starch carrier containing the remainder of the fragrance, the liquid component comprising those fragrance ingredients that are unaffected by the composition of the

30 base and the particulate carrier comprising those fragrance ingredients that are affected by the composition of the base.

There is additionally provided a method of providing a full fragrance to a wash, comprising the addition to the wash of a washing composition as hereinabove described.

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A washing composition typically comprises strongly alkaline materials such as sulphates, aluminosilicates and carbonates, plus powerful surfactants. Certain commonly-used perfume materials, such as aldehydes, acetates, esters, lactones and epoxides are among the most affected and degraded by the harsh environment of a laundry detergent, and the effect of this

40 environment can fundamentally change the hedonic effect desired by the perfumer. The separation

of these ingredients from the rest of the perfume formula and their encapsulation allows the full fragrance as formulated to be realised in a wash.

Therefore, in a particular embodiment, all fragrance ingredients of the fragrance that are
 5 aldehydes, acetates, esters, lactones and epoxides are encapsulated in starch prior to their addition to the washing composition.

Typical and non-limiting examples of aldehydes useful in this disclosure are as follows (the numbers in brackets are the relevant CAS Registry Numbers):

- 10 AdoxalTM (141-13-9); aldehyde c 110 undecylic (112-44-7); aldehyde c10 decylic (112-31-2); aldehyde c11 moa (19009-56-4); aldehyde c11 undecylenic (112-45-8); aldehyde c12 mna pur (110-41-8); aldehyde c6 hexylic (66-25-1); aldehyde c7 hepatic (111-71-7); aldehyde c8 octylic (124-13-0); aldehyde c9 isononylic (5435-64-3); aldehyde c9 nonylic (124-19-6); aldehyde iso c 11 (143-14-6); aldehyde c12 lauric (112-54-9); alpha amyl cinnamic aldehyde (122-40-7); alpha hexyl
 15 cinnamic aldehyde (101-86-0); alpha methyl cinnamic aldehyde (101-39-3); benzaldehyde (100-52-7); BourgeonalTM (18127-01-0); CetonalTM (65405-84-7); CitralTM (5392-40-5); CitronellalTM (106-23-0); cuminic aldehyde (122-03-2); CycloalTM C (68039-49-6); cyclamen aldehyde (103-95-7); cyclohexal (31906-04-4); decadienal (25152-84-5); decenal-2-trans (3913-81-3); decenal-4-trans (65405-70-1); decenal-9 (39770-05-3); dihydrofarnesal (51513-58-7); dodecenal (4826-62-4); (ethyl
 20 citral (41448-29-7); fennaldehyde (5462-06-6); Florhydral (125109-85-5); gardenol (93-92-5); geralddehyde (85417-87-4); GeranialTM (141-27-5); hydratropic aldehyde (93-53-8); hydratropic dimethyl acetal aldehyde (90-87-9); hydroxycitronellal (107-75-5); isobutyric aldehyde (78-84-2); isocyclocitral (1335-66-6); isovalerianic aldehyde (590-86-3); jasmacyclene (5413-60-5); LillialTM (80-54-6); MacealTM (67845-30-1); mefranal (55066-49-4); melonal (106-72-9); methional (3268-49-
 25 3); methoxymelonal (62439-41-2); methyl phenyl hexenal (21834-92-4); NeralTM (106-26-3); nonadienal (557-48-2); nonenal-6-cis (2277-19-2); phenyl acetic aldehyde (122-78-1); phenyl propionic aldehyde (104-53-0); safranal (116-26-7); scentenal (86803-90-9); tetrahydro citral (5988-91-0); tricyclal (68039-49-6); tridecenal-2-trans (7774-82-5); trifernal (16251-77-7); TropionalTM (1205-17-0); vernaldehyde (66327-54-6)

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Aldehydes may be present to the extent of up to 30% by weight of the total perfume in the composition.

Typical and non-limiting acetates and esters useful in this disclosure are as follows:

- 35 AgrumexTM (88-41-5); allyl caproate (123-68-2); allyl cyclohexyl propionate (2705-87-5); allyl heptanoate (142-19-8); allyl phenoxy acetate (7493-74-5); amyl butyrate (540-18-1); amyl phenyl acetate (5137-52-0); amyl salicylate (2050-08-0); anapear (189440-77-5); benzyl acetate (140-11-4); benzyl benzoate (120-51-4); benzyl butyrate (103-37-7); benzyl cinnamate (103-41-3); benzyl formate (104-57-4); benzyl isobutyrate (103-28-6); benzyl isovalerate (103-38-8); benzyl phenyl
 40 acetate (102-16-9); benzyl propionate (122-63-4); benzyl salicylate (118-58-1); bornyl acetate (76-

- 49-3); butyl acetate (123-86-4); butyl butyrate (109-21-7); butyl butyrolactate (7492-70-8); butyl lactate (138-22-7); c8 octylic acetate (112-14-1); cedryl acetate (77-54-3); cinnamyl acetate (103-54-8); cinnamyl cinnamate (122-69-0); citronellyl acetate (150-84-5); citronellyl butyrate (141-16-2); citronellyl formate (105-85-1); citronellyl isobutyrate (97-89-2); citronellyl phenyl acetate (139-70-8);
- 5 citronellyl propionate (141-14-0); cyclohexyl crotonate (31416-78-1); cyclohexyl ethyl acetate (21722-83-8); cyclohexyl isobutyrate (1129-47-1); cyclohexyl salicylate (25485-88-5); cydrane (10032-15-2); CyperateTM (31846-06-7); diethyl malonate (105-53-3); dihydro ambrate (37172-02-4); dihydro myrcenyl acetate (53767-93-4); dimethyl benzyl carbonyl butyrate (10094-34-5); ethoxalate citronellyle (60788-25-2); ethyl 2-decenoate (7367-88-6); ethyl 2-methyl butyrate (7452-79-1); ethyl acetate (141-78-6); ethyl acetoacetate (141-97-9); ethyl benzoate (93-89-0); ethyl butyrate (105-54-4); ethyl capronate (123-66-0); ethyl caprylate (106-32-1); ethyl cinnamate (103-36-6); ethyl cyclohexyl acetate (5452-75-5); ethyl decadienoate (3025-30-7); ethyl isobutyrate (97-62-1); ethyl isovalerate (108-64-5); ethyl linalyl acetate (61931-80-4); ethyl methyl-2-butyrate (7452-79-1); ethyl oenanthate (106-30-9); ethyl pelargonate (123-29-5); ethyl phenyl acetate (101-97-3); ethyl propionate (105-37-3); ethyl safranate (35044-59-8); ethyl salicylate (118-61-6); ethyl undecylenate (692-86-4); fenchyl acetate (13851-11-1); geranyl formate (105-86-2); fructose (6413-10-1); geranyl acetate (105-87-3); geranyl butyrate (106-29-6); geranyl formate (105-86-2); geranyl isobutyrate (2345-26-8); geranyl propionate (105-90-8); guaiyl acetate (134-28-1); hexenyl acetate (35926-04-6); hexenyl-3-cis acetate (3681-71-8); hexenyl-3-cis benzoate (25152-85-6);
- 20 hexenyl-3-cis butyrate (16491-36-4); hexenyl-3-cis formate (33467-73-1); hexenyl-3-cis hexenoate (61444-38-0); hexenyl-3-cis isobutyrate (41519-23-7); hexenyl-3-cis methyl-2-butyrate (53398-85-9); hexenyl-3-cis propionate (33467-74-2); hexenyl-3-cis salicylate (65405-77-8); hexyl acetate (142-92-7); hexyl butyrate (2639-63-6); hexyl isobutyrate (2349-07-7); hexyl propionate (2445-76-3); hexyl salicylate (6259-76-3); isoamyl acetate (123-92-2); isoamyl butyrate (106-27-4); isoamyl propionate (105-68-0); isobutyl acetate (110-19-0); isobutyl benzoate (120-50-3); isobutyl isobutyrate (97-85-8); isobutyl phenyl acetate (102-13-6); isobutyl salicylate (87-19-4); isononyl acetate pure (40379-24-6); isopentyl isovalerate (659-70-1); isopropyl 2-methylbutyrate (66576-71-4); isopropyl myristate (110-27-0); isopropyl undecylenate (5459-98-3); linalyl acetate (115-95-7); linalyl butyrate (78-36-4); linalyl cinnamate (78-37-5); linalyl formate (115-99-1); linalyl isobutyrate (78-35-3); linalyl isovalerate (50649-12-2); linalyl propionate (144-39-8); maltol isobutyrate (65416-14-0); ManzanateTM (39255-32-8); menthanyl acetate (58985-18-5); methyl benzoate (93-58-3); methyl camomille (6297-41-2); methyl cinnamate (103-26-4); methyl linoleate (112-63-0); methyl methyl butyrate (868-57-5); methyl phenyl acetate (101-41-7); methyl salicylate (119-36-8); myraldyl acetate (72403-67-9); neobergamate forte (1118-39-4); NeofolioneTM (111-79-5); nerolidyl acetate (2306-78-7); neryl acetate (141-12-8); nonadienyl acetate (68555-65-7); nonanyl acetate (143-13-5); nopyl acetate (128-51-8); octenoate-2, ethyl (7367-82-0); octenyl acetate (2442-10-6); oxyoctaline formate (65405-72-3); para-cresyl isobutyrate (103-93-5); para tertiary butylcyclohexyl acetate (32210-23-4); p-cresyl acetate (140-39-6); p-cresyl caprylate (59558-23-5); p-cresyl phenyl acetate (101-94-0); phenoxyethyl isobutyrate (103-60-6); phenylethyl acetate (103-45-7); phenyl ethyl butyrate (103-52-6); phenyl ethyl cinnamate (103-53-7); phenyl ethyl formate (104-62-1);
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phenyl ethyl isobutyrate (103-48-0); phenyl ethyl phenyl acetate (102-20-5); phenyl ethyl salicylate (87-22-9); phenyl propyl acetate (122-72-5); prenyl acetate (1191-16-8); propyl decadienoate (84788-08-9); styralyl propionate (120-45-6); terpinyl acetate (80-26-2); terpinyl propionate (80-27-3); tetrahydro linalyl acetate (20780-48-7); vetivenyl acetate (68917-34-0)

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Acetates may be present to the extent of up to 50% by weight of the total perfume in the composition.

Esters may be present to the extent of up to 90% by weight of the total perfume in the composition.

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Typical and non-limiting lactones useful in this disclosure are as follows:

4-methyl gamma decalactone (7011-83-8); caramel lactone (28664-35-9); delta decalactone (705-86-2); delta dodecalactone (713-95-1); delta jasmin lactone (25524-95-2); delta octalactone (698-76-0); delta undecalactone (710-04-3); gamma decalactone (706-14-9); gamma dodecalactone (2305-05-1); gamma heptalactone (105-21-5); gamma hexalactone (695-06-7); gamma jasmin lactone (cis- 63095-33-0, trans- 97416-87-0); gamma nonalactone (104-61-0); gamma octalactone (104-50-7); gamma undecalactone (104-67-6); gamma valerolactone (108-29-2); jasmolactone (32764-98-0); koumalactone (92015-65-1); lactoscatone (21280-29-5)

20 Typical and non-limiting examples of epoxide fragrance ingredients include ethyl phenyl glycidate (121-39-1) and ethyl methyl phenyl glycidate (77-83-8). These two are most commonly encountered together. Ethyl methyl phenyl glycidate is sold under the name "fraise pure".

25 Starch encapsulation of fragrance is a well-known technology that has been used in industry for many years. It involves the emulsification of fragrance and a modified hydrophobic starch in water, and this emulsion is then spray-dried to give fragrance-containing particles.

Spray drying is a well-established industrial technique, used to produce powder granules for the food, pharmaceutical and chemical industries. This process is preferred for encapsulation over other techniques as it is faster, more economical and efficient. During the spray drying process, a mixture of the material to be encapsulated and a solution of encapsulant material in a solvent is sprayed into a heated chamber in the form of atomized droplets. The liquid part of the droplets evaporates rapidly, producing powder granules. The morphology of the spray-dried granules can be controlled by controlling various spray drying parameters. For encapsulation, the choice of encapsulant material is crucial and depends on the particular application. Usually an amphipathic carrier material is chosen as encapsulating material. As the droplets start to dry, the hydrophobic part of the amphipathic carrier attaches itself to the surface of the material to be encapsulated. Subsequent drying increases the concentration of the encapsulant material on the surface of the core material and forms a solid particle.

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For encapsulation of fragrance compounds, the starch must have no reactivity with the fragrance, be present in a form that is easy to handle, i.e. with low viscosity at high concentration to allow a complete elimination of solvent in any processes requiring a phase of desolvation, give the maximum protection of the fragrance against external factors, ensure good emulsion stabilization properties and effective redispersion behaviour in order to release the fragrance at the times and the place desired.

Starches suitable for encapsulating fragrances can be made from, raw starch, pregelatinized starch, modified starch derived from tubers, legumes, cereal and grains, for example corn starch, wheat starch, rice starch, waxy corn starch, oat starch, cassava starch, waxy barley, waxy rice starch, sweet rice starch, amioca, potato starch, tapioca starch, oat starch, cassava starch, and mixtures thereof.

Modified starches suitable for use as the encapsulating matrix include hydrolyzed starch, acid-thinned starch, starch esters of long chain hydrocarbons, starch acetates, starch octenyl succinates, and mixtures thereof.

The term "hydrolyzed starch" refers to oligosaccharide-type materials that are typically obtained by acid and/or enzymatic hydrolysis of starches, preferably corn starch. Suitable hydrolyzed starches for inclusion in the present invention include maltodextrins and corn syrup solids.

Starch esters having a degree of substitution in the range of from about 0.01 % to about 10.0% may be used to encapsulate the perfume oils of the present invention. The hydrocarbon part of the modifying ester is from a C5 to C16 carbon chain. In a particular embodiment, octenylsuccinate (OSAN) substituted waxy corn starches of various types such as 1) waxy starch: acid thinned and OSAN substituted, 2) blend of corn syrup solids: waxy starch, OSAN substituted, and dextrinized, 3) waxy starch: OSAN substituted and dextrinized, 4) blend of corn syrup solids or maltodextrins with waxy starch: acid-thinned OSAN substituted, and then cooked and spray dried, 5) waxy starch: acid thinned and OSAN substituted then cooked and spray dried, and 6) the high and low viscosities of the above modifications (based on the level of acid treatment) may be used.

Modified starches having emulsifying and emulsion stabilizing capacity such as starch octenyl succinates have the ability to entrap the fragrance droplets in the emulsion due to the hydrophobic character of the starch modifying agent. The perfume oils remain trapped in the modified starch until dissolve in the wash solution, due to thermodynamic factors i. e., hydrophobic interactions and stabilization of the emulsion because of steric hindrance.

In a particular embodiment, the starch used is starch sodium octenyl succinate. A formulation for the encapsulation of that part of the fragrance to be encapsulated is

45-55% (wt) perfume

30-44% starch sodium octenyl succinate

Other ingredients may also be included. For example, a humectant may be added to prevent the starch from drying out. Typical examples include sugar alcohols such as mannitol, sorbitol, xylitol, erythritol and isomalt. This also helps to achieve a uniform dispersion. Such a material may be present at a weight proportion of from 4-8% by weight. Another possible ingredient is a bulking agent. A typical example is a finely-divided silica, such as a fumed silica, a typical material being Aerosil™ 200. This is present in a weight proportion of from 0.05-3%.

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The fragrance formulation for use in the washing composition is divided in two parts, one part comprising the ingredients to be incorporated into the particulate starch carrier, and the other added to the washing composition base, the proportions of the two parts of the fragrance being such that a combination of the two would provide the complete fragrance as formulated.

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The particulate carrier is prepared by first blending the fragrance ingredients to be encapsulated and then emulsifying them in water with the starch. The emulsion is then spray-dried by spraying into a heated chamber and collecting the resulting particles. The normal techniques and conditions of spray drying of fragrance particles are well known and may be used here.

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The washing composition base, which may be a solid or liquid composition, consists of all the usual ingredients of a dry washing composition other than fragrance. These include detergents, surfactants, abrasives, alkalis, enzymes, colouring matters and dyestuffs, optical brighteners, preservatives, anti-bacterial and anti-fungal materials, surface tension modifiers, and the like. They may be used in art-recognised proportions. That part of the fragrance, which is added to the washing composition base, is used in such a proportion that, in combination with the fragrance in the particulate carrier, it delivers the full fragrance formulation in the wash solution.

The fragranced washing composition is prepared by adding the starch-encapsulated component of the fragrance to the washing composition base and mixing thoroughly. The remaining non-encapsulated component of the fragrance is then added to this mixture with stirring until the result is a dry powder.

The combined fragrances are typically present to the extent of from 0.05% and 1.5% by weight of the complete two-component washing composition.

Washing compositions according to this disclosure have the advantage that, in use in a wash, the full fragrance as formulated by the perfumer is delivered, without any loss of particular fragrance notes as a result of interaction with harsh washing ingredients.

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The disclosure is further described with reference to the following examples, which describe particular embodiments, and which are not intended to be in any way limiting. All parts and percentages, unless otherwise specified, are by weight.

5 Example

A fragrance formulation for use in the washing composition was formulated in two parts. One part comprised detergent-unstable ingredients to be incorporated into a starch encapsulate formulation (designated as "Fragile"). The other part to be added directly to the washing composition base comprised detergent-stable ingredients (designated as "Robust"). The proportions of the two parts of the fragrance were such that a combination of the two would provide the complete fragrance as formulated.

The "fragile" components are shown in Table 1 and the "robust" in Table 2. The fragrance content of the starch-encapsulated part was 50% of the weight of the individual particles.

Table 1

Starch-Encapsulated fragrance part ("Fragile")		
INGREDIENTS	QUANTITY	Cas No
BENZYL ACETATE	150	140-11-4
DIPROPYLENE GLYCOL	120.8	25265-71-8
ORANGE TERPENES DISTILLED	120	68647-72-3
LINALYL ACETATE (SYNT)	80	115-95-7
JASMACYLENE™	60	54830-99-8
HEXYL ACETATE	60	142-92-7
AGRUMEX™	50	88-41-5
ETHYL ACETOACETATE	40	141-97-9
FRUCTONE™	40	6413-10-1
PEACH PURE	30	104-67-6
ALLYL OENANTHATE	25	142-19-8
BUTYL ACETATE	20	123-86-4
AMYL SALICYLATE	20	2050-08-0
ETHYL METHYL-2- BUTYRATE	15.9	7452-79-1
CYCLAMEN ALDEHYDE EXTRA	15	103-95-7
ALLYL AMYL GLYCOLATE	10	67634-00-8
TRICYCLAL™	8	68039-49-6
HEXENYL-3-CIS ACETATE	6	3681-71-8
ETHYL ISOAMYL KETONE	5	541-85-5
GARDENOL™	5	93-92-5
CITRAL TECH	4	5392-40-5

FRAISE PURE	4	77-83-8
ISOMENTHONE™ DL	4	491-07-6
CITRATHAL™ R	4	147060-73-9
LAURIC ALDEHYDE C 12	3	112-54-9
MACEAL™	0.2	68259-31-4
THIOGERANIOL 1%/TEC	0.1	39067-80-6
Total	900	

Table 2

Non Encapsulated Fragrance part ("Robust")		
INGREDIENTS	QUANTITY	CAS No
GALAXOLIDE™	45	1222-05-5
ISO E SUPER™	40	54464-57-2
FIXOLIDE™	10	21145-77-7
DIPROPYLENE GLYCOL	5	25265-71-8
Total	100	

The complete perfume ("Fragile" + "Robust") - see Sample d hereinunder – had an olfactory description that was described as fruity, green, pear, aldehydic, musky, heliotrope.

An encapsulated perfume was prepared as follows, using the following formula.

Component	Supplier	CAS	%	Role
"Fragile" Fragrance	GIVAUDAN	N/A	25	Active
WATER DRINKABLE GRADE	GIVAUDAN	N/A	50	Solvent
STARCH SODIUM OCTENYL SUCCINATE E1450	National Starch	52906-93-1	18	Emulsifier
MANNITOL 60	Roquette	69-65-8	5	Stabiliser and humectant
Total			100	

10 An emulsion was prepared as follows:

To tap water (46.0 parts) was added starch sodium octenyl succinate E1450 (22 parts), and mannitol 60 (5 parts). The resulting mixture was first manually stirred with a stainless steel rod and then homogenized with an IKA T25 Ultra-Turrax Homogenizer at 13,500 rpm to obtain a homogeneous solution. To this resulting mixture, perfume oil (27 parts) was added. High shear mixing was then carried out for 20-30 min at 22,000-24,000 rpm using the same homogenizer to produce an emulsion.

The emulsion was spray-dried using a LabPlant SD-06 Spray Dryer, using the following parameters:

The spray droplet size was to be between 0.5 and 2 μm (controlled by dynamic light scattering)

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- Inlet Temperature: 190 °C
 - Outlet Temperature: 90 °C
 - Peristaltic pump speed: 485 mL/h
 - Air flow rate: 3.7 m/s

The resulting spray is a dry powder

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(a) Preparation of detergent compositions

Base Formula: A powder detergent base ("PD base") was prepared as follows:

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Chemical Name	CAS	Composition (%) by Weight
Sodium linear alkyl benzene sulphonate	68411-30-3	14
Sodium aluminosilicate	1344-00-9	15
Sodium sulphate	7757-82-6	QS to 100
Sodium carbonate	497-19-8	13

This base was used to prepare the following detergent compositions for comparing 2 sets of findings

20 Set 1:

Sample a: PD base dosed with starch-encapsulated "Fragile" component @ 0.72% by weight - as the encapsulated material contains 50% fragrance, this gives a "Fragile" perfume loading of 0.36%

Sample b: PD sample dosed with unencapsulated "Fragile" component @0.36%

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Set 2:

Sample c: PD base dosed with starch-encapsulated "Fragile" component @ 0.72% + "Robust" component @0.04%

Sample d: PD base dosed with unencapsulated "Fragile" component @0.36% + "Robust" component @0.04%

Note: Sample d is equivalent to the whole fragrance (mixture of "Fragile" and "Robust" components)

Sample preparation method:

Set 1 :

- Sample a: To PD base (99.28% by weight of total mixture) was added starch-encapsulated "Fragile" @ 0.72% and mixed thoroughly to homogenize.
- Sample b: To PD base (99.28% by weight) was added unencapsulated "Fragile" @ 0.36% and mixed thoroughly to homogenize.

Set 2:

- Sample c: To PD base (99.24% by weight of total mixture) was added starch-encapsulated "Fragile" @ 0.72% + "Robust" @0.04% and mixed thoroughly to homogenize.
- Sample d: : To PD base (99.24% by weight of total mixture) was added unencapsulated "Fragile" @ 0.36% + "Robust" @0.04% and mixed thoroughly to homogenize

- Samples were prepared and kept for maceration at room temp for 5 days. One set of samples was kept at 45°C, and these were evaluated at Day 30. For checking the performance of the fragrance, cloths are washed with detergent according to the following procedure:

(b) Testing of detergent compositions :

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The detergent wash test solution preparation was as follows:

(i) The wash mixtures were:

Set 1 : Sample a and Sample b

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Set 2: Sample c and Sample d.

The wash test evaluation samples preparation procedures were performed as follows:

- (ii) 4 bowls of approximately 3-4 L capacity were taken;
- (iii) 6g Samples a, b, c and d were added to the bowls in 1.5 ltr water and mixed by hand
- 35 (iv) Two small towels were added to each of the 4 bowls and allowed to soak for 30 minutes;
- (v) The towels were rubbed manually 10 times in the wash solution in the manner of someone removing a stain from fabric.
- (vi) One of each pair of towels was rinsed, then rubbed 5 times (mimicking the hand-
- 40 washing described in (v)) in 1.5L of clean water. This step was then repeated.

- (vii) The rinsed towel was squeezed out, whereas the towel that had not been subjected to rinsing was left in the bowl.

The unrinsed towel in the bowl was raised from the bowl by tongs for testing by an expert panel.

Both were compared for odour strength, using a scale of from 0-5, where 0 is no fragrance

- 5 detectable, 3 is good and 5 is very strong. In addition, the olfactory qualities were assessed in comparison with the complete fragrance.

Wash test Evaluation result, Samples are evaluated on Day 5 (Room Temp) and day 30 (Collected from 45°C oven) Scale: 0-5 (0 - No fragrance) (5 - strong Fragrance)						
	Day 5			Day 30- Sample from 45°C oven		
Candidates: Set 1	Soaking	Wet	Comments	Soaking	Wet	Comments
Sample b	3.5	3		1	1	
Sample a	4	3.5	Better green, floral fruity note than Sample b	2.5	2.5	Very distinct, more green, fruity note than Sample b
Candidates: Set 2						
Sample d	4.0	3.5		2.5	2.5	
Sample c	4.5	4.0	Better green, floral fruity note than sample d	3.5	3.5	Distinctly enhanced green, fruity fragrance in comparison to Sample d

It was noticed that, not only was the odour of the samples utilising starch-encapsulated fragrance stronger than those of the unencapsulated fragrance, but also that the samples utilising starch

- 10 encapsulation retained much more of the olfactory qualities of the complete perfume.