

(11)

EP 4 741 481 A1

(12)

EUROPEAN PATENT APPLICATION
published in accordance with Art. 153(4) EPC

(43) Date of publication:
13.05.2026 Bulletin 2026/20

(21) Application number: **24836172.7**

(22) Date of filing: **09.05.2024**

(51) International Patent Classification (IPC):
C11D 17/06 ^(2006.01) **C11D 3/22** ^(2006.01)
C11D 3/37 ^(2006.01) **C11D 3/20** ^(2006.01)
C11D 3/04 ^(2006.01) **C11D 3/386** ^(2006.01)
C11D 1/83 ^(2006.01)

(52) Cooperative Patent Classification (CPC):
C11D 1/83; C11D 3/04; C11D 3/20; C11D 3/22;
C11D 3/37; C11D 3/386; C11D 17/06

(86) International application number:
PCT/KR2024/006219

(87) International publication number:
WO 2025/009723 (09.01.2025 Gazette 2025/02)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL
NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
GE KH MA MD TN

(30) Priority: **06.07.2023 KR 20230087794**

(71) Applicant: **Luthione Co., Ltd**
Bucheon-si Gyeonggi-do 14556 (KR)

(72) Inventors:
• **LEE, Kun Hee**
Incheon 22210 (KR)
• **KIM, Yong Ho**
Seoul 02726 (KR)

(74) Representative: **You Patent**
3rd & 4th Floor
84 Salop Street
Wolverhampton WV3 0SR (GB)

(54) **SHEET-TYPE LAUNDRY DETERGENT MANUFACTURING METHOD**

(57) A sheet type laundry detergent manufacturing method is disclosed. The method includes aging a laundry detergent composition containing purified water, polyvinyl alcohol (PVA), polyvinylpyrrolidone (PVP), starch, and a surfactant in an aging room. The aged composition is foamed using a foaming device to obtain a predetermined density and viscosity. The foamed composition is then applied onto a release film at a predetermined thickness using a comma coater. Thereafter, the release film coated with the composition is dried to remove only the purified water, thereby forming the composition into a sheet material. The formed sheet material is peeled from the release film. In addition, a plurality of sheet materials may be laminated by spraying water in a mist form, stacking one or more sheets, and drying the stacked sheets. Through the disclosed manufacturing method, a sheet-type laundry detergent having improved handling properties and process stability may be provided.

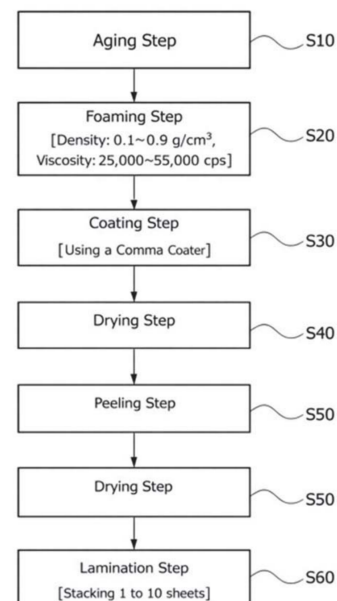


FIG. 1

EP 4 741 481 A1

Description**BACKGROUND OF THE INVENTION****Field of the Invention**

[0001] The present invention relates to a sheet type laundry detergent manufacturing method.

Background Art

[0002] In general, detergents used in washing machines have conventionally been provided in the form of powder detergents or liquid detergents.

[0003] However, liquid detergents are relatively heavy, which may discourage consumer use, while powder detergents tend to generate airborne dust during handling and leave residues after washing. Accordingly, there has been a continuous demand for the development of a new type of laundry detergent that overcomes such drawbacks.

[0004] In response to these issues, sheet-type solid laundry detergents have been developed as an improvement over conventional detergents. Nevertheless, such sheet-type solid detergents typically exhibit alkaline properties, which may cause skin irritation or damage, and further suffer from insufficient solubility of the sheet itself, resulting in incomplete dissolution during washing.

DETAILED DESCRIPTION OF THE INVENTION**Technical Problem**

[0005] In view of the above technical background, the present invention has been devised to provide a method for manufacturing a sheet-type laundry detergent that has excellent washability, excellent solubility, and is easy to store and use.

Means for Solving the Technical Problem

[0006] A method for manufacturing a sheet-type laundry detergent according to one embodiment of the present invention includes aging, in an aging room, a laundry detergent composition prepared by including PVA, PVP, starch, and a surfactant in purified water, foaming, by using a foaming device, the laundry detergent composition that has undergone the aging such that the density becomes 0.1 to 0.9 g/cm² and the viscosity becomes 25,000 to 55,000 cps, placing the foamed laundry detergent composition in a coating solution tank of a comma coater and applying the composition onto a release film at a predetermined thickness, placing the release film and the laundry detergent composition that has undergone the coating into a dryer to dry only the purified water so as to form the laundry detergent composition applied to the release film into a sheet, peeling the laundry detergent composition maintained in a sheet form and from which the purified water has been removed through the drying from the release film, and spraying water in a mist form onto the laundry detergent composition in the sheet form obtained through the peeling, stacking 1 to 10 sheets, and then placing the stacked sheets into the dryer to laminate a plurality of sheet-type laundry detergent compositions.

[0007] The laundry detergent composition may include, based on the total weight thereof, 7 to 17 wt% of the PVA, 2 to 8 wt% of the PVP, and 2 to 8 wt% of the starch.

[0008] The surfactant may include 40 to 60 wt% of AOS-1416 as an anionic surfactant, 2 to 8 wt% of PCG as an anionic surfactant, and 6 to 14 wt% of APG as a nonionic surfactant.

[0009] The composition may further include 0.1 to 0.6 wt% of sodium benzoate, 0.3 to 1.5 wt% of sodium citrate, 0.3 to 1.5 wt% of citric acid, and 1 to 6 wt% of salt.

[0010] The composition may further include 0.3 to 3 wt% of a natural soap component, 0.3 to 3 wt% of a silk extract, 0.5 to 6 wt% of cyclodextrin, and 0.5 to 6 wt% of a plurality of enzymes.

[0011] The aging step may age the laundry detergent composition for 2 to 50 hours at a temperature of 25 to 70°C.

[0012] The coating step may apply the composition to a thickness of 0.3 to 3.8 mm.

[0013] In the drying step, the dryer temperature may be set to 40 to 210°C and the drying speed may be set to 0.3 to 6 m/min to dry the purified water.

[0014] In the peeling step, the peeled sheet may have a thickness of 0.3 to 3.8 mm and a density of 0.03 to 0.35 g/cm³.

[0015] In the lamination step, the dryer may have a temperature of 50 to 130°C.

Effects of the Invention

[0016] The method for manufacturing a sheet-type laundry detergent according to one embodiment of the present invention may have excellent washability, excellent solubility, and convenience in storage and use.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017]

FIG. 1 is a flowchart illustrating a sheet type laundry detergent manufacturing method according to one embodiment of the present invention.

FIG. 2 is a perspective view illustrating a sheet type laundry detergent according to one embodiment of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0018] Hereinafter, embodiments of the present invention will be described in detail with reference to the accompanying drawings so that a person having ordinary skill in the art to which the present invention pertains can readily practice the invention. The present invention may be embodied in various different forms and is not limited to the embodiments described herein. In the drawings, portions irrelevant to the description are omitted for clarity, and the same or similar reference numerals are used to designate the same or similar components throughout the specification.

[0019] As used herein, the terms "comprise," "include," or "have" are intended to specify the presence of stated features, numbers, steps, operations, components, parts, or combinations thereof, but do not preclude the presence or addition of one or more other features, numbers, steps, operations, components, parts, or combinations thereof. Further, when a layer, film, region, plate, or the like is described as being "on" another element, it includes not only the case where the element is directly on the other element, but also the case where one or more intervening elements are present therebetween. Conversely, when a layer, film, region, plate, or the like is described as being "under" another element, it includes not only the case where the element is directly under the other element, but also the case where one or more intervening elements are present therebetween.

[0020] FIG. 1 is a perspective view illustrating a sheet type laundry detergent according to one embodiment of the present invention.

[0021] Referring to FIG. 1, a sheet type laundry detergent 1 is manufactured using purified water, polyvinyl alcohol (PVA), polyvinylpyrrolidone (PVP), and starch, and may further include a surfactant. The surfactant may serve as a cleaning-active component of the laundry detergent sheet.

[0022] The sheet type laundry detergent 1 may comprise, based on a total weight of the sheet type laundry detergent, 7 to 17 wt% of PVA, 2 to 8 wt% of PVP, and 2 to 8 wt% of starch, and may further include a surfactant. For example, the sheet type laundry detergent 1 may comprise, based on the total weight thereof, 10 wt% of PVA, 5 wt% of PVP, 6 wt% of starch, and may further include APG and PCG, which are natural surfactants.

[0023] Hereinafter, examples are provided to facilitate understanding of the present invention. However, the following examples are merely provided for illustrative purposes, and the present invention is not limited by these examples.

Examples: Performance Evaluation of Laundry Detergent Sheets**Example 1**

[0024] A laundry detergent sheet was prepared to include, based on a total weight thereof, 10 wt% of polyvinyl alcohol (PVA), 5 wt% of polyvinylpyrrolidone (PVP), 6 wt% of starch, and 48 wt% of natural surfactants including APG and PCG.

Example 2

[0025] A laundry detergent sheet was prepared to include, based on a total weight thereof, 15 wt% of polyvinyl alcohol (PVA), 5 wt% of polyvinylpyrrolidone (PVP), 5 wt% of starch, and 50 wt% of natural surfactants including APG and PCG.

Example 3 (Comparative Example)

[0026] A laundry detergent sheet was prepared to include, based on a total weight thereof, 30 wt% of polyvinyl alcohol (PVA), 5 wt% of starch, and 60 wt% of a mixture of chemical surfactants including sodium lauryl sulfate (SLS) and sodium laureth sulfate (SLES).

Test Example 1: Tensile Strength Evaluation

[0027] Tensile strength is one of the indices representing the mechanical strength of a material. In this evaluation: when the tensile strength is 10 or higher, the sheet is rigid and exhibits excellent shape retention, but requires a relatively large force to be torn; when the tensile strength is in a range of 4 to 9, the sheet is rigid, maintains its shape stably, and can be easily torn by human force; and when the tensile strength is less than 3, the sheet lacks sufficient rigidity, has poor shape retention, and tends to break or crumble.

Test Example 2: Anti-Redeposition Performance Evaluation

[0028] Anti-redeposition performance refers to an ability to prevent dust, contaminants, or soil from reattaching to laundry after a washing process using the laundry detergent sheet 1. When dust is not easily attached to the laundered fabric, the anti-redeposition performance is evaluated as high, whereas when dust is easily attached, the anti-redeposition performance is evaluated as low.

Table 1

Category	Tensile Strength (kg/cm ²)	Degree of Dust Adhesion
Example 1	3.8	Low
Example 2	4.5	Low
Example 3	6.2	High

[0029] The test conditions for Table 1 are as follows.

[0030] Sheet dimensions: width of 10 mm, length of 10 mm, and thickness of 0.03 mm.

[0031] Tensile strength measuring instrument: a paper tensile strength tester manufactured by Frank PTI.

[0032] Test method: laundry was performed by placing the laundry detergent sheet according to each example together with laundry in a washing machine, operating the washing machine under conditions of a washing time of 1 hour and a water level of 40 cm, drying the laundry after washing, and then scattering dust and contaminants onto the dried laundry to observe dust adhesion.

[0033] As shown in Table 1, a laundry detergent sheet containing more than 15 wt% of PVA and not containing PVP exhibits relatively low tensile strength and high dust adhesion, and is therefore not suitable for use as a laundry detergent sheet. In contrast, a laundry detergent sheet containing 15 wt% or less of PVA and including PVP exhibits higher tensile strength and lower dust adhesion, and is therefore more suitable as a laundry detergent sheet. More specifically, a laundry detergent sheet containing, based on the total weight thereof, 10 wt% of PVA, 5 wt% of PVP, 6 wt% of starch, and 48 wt% of natural surfactants including APG and PCG may be the most desirable.

[0034] Through this configuration, the sheet type laundry detergent according to the present invention contains a smaller amount of PVA than conventional sheet-type detergents containing 15 to 30 wt% of PVA, thereby allowing a larger amount of active ingredients required for washing to be included. As a result, cleaning performance may be improved and the size of the sheet may be reduced, thereby improving convenience in storage and use. In addition, by further including PVP, the tensile strength of the sheet may be enhanced, the shape of the sheet may be stably maintained even during long-term storage, and the sheet may be easily torn at a desired portion during use. Furthermore, reattachment of dust or contaminants to laundered clothes may be prevented after washing. Moreover, by using natural surfactants, environmental pollution associated with detergent use may be reduced.

[0035] The surfactant may comprise: 44 to 46 wt% of AOS-1416, which is an anionic surfactant; 2 to 4 wt% of PCG, which is an anionic surfactant; and 6 to 14 wt% of APG, which is a nonionic surfactant. For example, the surfactant may comprise, based on the total weight thereof, 45 wt% of AOS-1416, 3 wt% of PCG, and 12 wt% of APG.

[0036] Hereinafter, additional examples are provided to facilitate understanding of the present invention. However, the following examples are merely provided for illustrative purposes, and the present invention is not limited by these examples.

Examples: Environmental Impact EvaluationExample 1

[0037] A laundry detergent sheet was prepared by applying a natural surfactant composition comprising, based on a total weight thereof, 40 wt% of AOS-1416, which is an anionic surfactant, 3 wt% of PCG, which is an anionic surfactant, and 12 wt% of APG, which is a nonionic surfactant.

Example 2

[0038] A laundry detergent sheet was prepared by applying a natural surfactant composition comprising, based on a total weight thereof, 45 wt% of AOS-1416, 3 wt% of PCG, and 10 wt% of APG.

Example 3 (Comparative Example)

[0039] A laundry detergent sheet was prepared by applying a chemical-based surfactant composition comprising, based on a total weight thereof, 60 wt% of a mixture of sodium lauryl sulfate (SLS) and sodium laureth sulfate (SLES).

Test Example 1: Nitrosamine Exposure Evaluation

[0040] Nitrosamine exposure refers to a level of nitrosamines, which are carcinogenic substances that may be exposed to human skin through contact with laundered fabrics. A higher level of detected nitrosamines indicates a greater potential risk to the human body, whereas a lower level indicates a reduced potential risk. Five locations on each laundered fabric were randomly selected for analysis. The evaluation criteria were as follows: detection of nitrosamines at four or more locations: "Risk"; detection of nitrosamines at fewer than four locations: "Warning"; and detection of nitrosamines at only one location: "Good."

Test Example 2: Chemical Accumulation in Effluent Water

[0041] This test evaluated a degree of chemical accumulation detected in wash water discharged after completion of a washing process. A higher level of detected chemical accumulation indicates a greater adverse impact on environmental pollution, whereas a lower level indicates a reduced environmental impact. When non-degradable chemical substances, such as per- and polyfluoroalkyl substances (PFAS) or antimony (Sb), were detected in the discharged wash water, the evaluation result was classified as "Harmful." When such substances were not detected, the evaluation result was classified as "Harmless."

Table 2

Category	Nitrosamine Exposure Level	Environmental Pollution Level
Example 1	Warning	Harmful
Example 2	Good	Harmless
Example 3	Risk	Harmful

[0042] The test conditions for Table 2 are as follows.

[0043] Laundry load weight: 10 kg.

[0044] Test method: laundry was performed by placing the laundry detergent sheet according to each example together with the laundry in a washing machine, operating the washing machine for 1 hour at a water level of 40 cm.

[0045] As shown in Table 2, a laundry detergent sheet containing a chemical-based surfactant exhibits excessive detection of nitrosamines and is therefore not suitable for use as a laundry detergent sheet. In contrast, a laundry detergent sheet containing a natural surfactant exhibits only trace detection of nitrosamines and releases a smaller amount of chemical discharge when mixed with water, and is therefore more suitable as a laundry detergent sheet. More specifically, a laundry detergent sheet to which a natural surfactant composition comprising, based on a total weight thereof, 45 wt% of AOS-1416, 3 wt% of PCG, and 10 wt% of APG is applied may be the most desirable.

[0046] Through this configuration, the laundry detergent sheet 1 according to the present invention may reduce environmental pollution and may address issues related to potentially carcinogenic nitrosamines, which have been associated with chemical-based surfactants. In addition, exposure of skin to chemical accumulates and chemical metabolites remaining on laundered items such as clothing or bedding due to chemical-based surfactants may be reduced, thereby potentially mitigating adverse effects such as endocrine disruption, scalp irritation, hair loss, dermatitis, or atopic conditions. Furthermore, discharge of chemical substances into wash water used for cleaning laundry may be reduced, thereby further decreasing environmental pollution.

[0047] The sheet type laundry detergent 1 may further comprise, based on a total weight thereof: 0.1 to 0.6 wt% of sodium benzoate; 0.3 to 1.5 wt% of sodium citrate; 0.3 to 1.5 wt% of citric acid; and 1 to 6 wt% of salt.

[0048] The sheet type laundry detergent 1 may further comprise, based on the total weight thereof: 0.3 to 3 wt% of a natural soap component; 0.3 to 3 wt% of a silk extract; 0.5 to 6 wt% of cyclodextrin; and 0.5 to 6 wt% of a plurality of enzymes.

[0049] Hereinafter, additional examples are provided to facilitate understanding of the present invention. However, the following examples are merely provided for illustrative purposes, and the present invention is not limited by these examples.

5 Examples: Laundry Performance Results

Example 1

[0050] A laundry detergent sheet was prepared to include, based on a total weight thereof, 0.3 wt% of sodium benzoate, 0.7 wt% of sodium citrate, 0.7 wt% of citric acid, 4 wt% of salt, 1 wt% of noni extract, 1 wt% of silk extract, 3 wt% of cyclodextrin, and 3 wt% of seven types of enzymes.

Example 2

[0051] A laundry detergent sheet was prepared to include, based on a total weight thereof, 0.3 wt% of sodium benzoate, 0.7 wt% of sodium citrate, 0.7 wt% of citric acid, 4 wt% of salt, and 1 wt% of silk extract.

Test Example 1: Composite Odor Evaluation

[0052] Composite odor refers to a composite odor dilution ratio (odor unit, OU) generated per unit space (1 m³) over 1 minute. Odor generated from laundered fabrics after completion of washing was measured using an air dilution olfactory method. The evaluation criteria were as follows: 20 OU or more: "Normal"; less than 20 OU: "Good."

Test Example 2: Lint and Fiber Residue Evaluation

[0053] The degree of lint and loose fibers present on laundered fabrics after completion of washing was evaluated. The evaluation criteria were as follows: lint and loose fibers occupying 60% or more of a fabric surface area: "Minor"; lint and loose fibers occupying 20% or more and less than 60% of the fabric surface area: "Normal"; and lint and loose fibers occupying less than 20% of the fabric surface area: "Excellent."

Table 3

Category	Composite Odor (Dilution Ratio, OU)	Degree of Lint
Example 1	13	Excellent
Example 2	26	Normal

[0054] The test conditions for Table 3 are as follows.

[0055] Laundry load: 10 kg.

[0056] Test method: laundry was performed by placing the laundry detergent sheet according to each example together with the laundry in a washing machine, operating the washing machine for 1 hour at a water level of 40 cm.

[0057] As shown in Table 3, a laundry detergent sheet composed only of sodium benzoate, sodium citrate, citric acid, salt, and a silk extract does not sufficiently remove odors and exhibits limited capability in removing lint, and is therefore not suitable for use as a laundry detergent sheet. In contrast, a laundry detergent sheet further including a natural soap component (noni extract), cyclodextrin, and enzymes provides an additional deodorizing function, improved lint-removal performance due to the enzymes, and a reduced environmental impact attributable to the natural soap component, and is therefore more suitable for use as a laundry detergent sheet.

[0058] Through this configuration, the laundry detergent sheet 1 according to the present invention may exhibit enhanced deodorization performance, may more effectively remove lint from laundered items due to the inclusion of enzymes, and may further reduce environmental pollution through the use of a natural soap component such as a noni extract.

[0059] A most desirable laundry detergent sheet 1 prepared according to the above examples may have the following composition.

Table 4

Component	Content (wt%)
Polyvinyl alcohol (PVA)	7-17

(continued)

Component	Content (wt%)
Polyvinylpyrrolidone (PVP)	2-8
Starch	2-8
Anionic surfactant - AOS-1416	44-46
Anionic surfactant - PCG	2-4
Nonionic surfactant - APG	6-14
Sodium benzoate	0.1-0.6
Sodium citrate	0.3-1.5
Citric acid	0.3-1.5
Salt	1-6
Natural soap component	0.3-3
Silk extract	0.3-3
Dextrin (Cyclodextrin)	0.5-6
Enzymes	0.5-6

[0060] FIG. 2 is a flowchart illustrating a sheet type laundry detergent manufacturing method according to one embodiment of the present invention.

[0061] Referring to FIG. 2, the sheet type laundry detergent manufacturing method may include an aging step (S10), a foaming step (S20), a coating step (S30), a drying step (S40), a peeling step (S50), and a lamination step (S60).

[0062] In the aging step (S10), a laundry detergent composition prepared by including purified water, polyvinyl alcohol (PVA), polyvinylpyrrolidone (PVP), starch, and a surfactant may be aged in an aging room.

[0063] The aging step (S10) may be performed by aging the laundry detergent composition for 2 to 50 hours at a temperature of 25 to 70°C. For example, the aging step (S10) may be performed by aging the laundry detergent composition for 25 hours at 55°C.

[0064] The laundry detergent composition may be a solution obtained by adding purified water, a surfactant, PVA, PVP, and starch to a heated mixture, and then mixing sodium benzoate, sodium citrate, extracts, and fragrances therewith. For example, the laundry detergent composition may be a thickened solution prepared by mixing purified water, a surfactant, PVA, PVP, and corn starch, heating the mixture, adding sodium benzoate, sodium citrate, extracts, and fragrances thereto, and adjusting a pH of the mixture to increase viscosity.

[0065] In the foaming step (S20), the laundry detergent composition that has undergone the aging step (S10) may be foamed using a foaming device such that the composition has a density of 0.1 to 0.9 g/cm³ and a viscosity of 25,000 to 55,000 cps.

[0066] The foaming step (S20) may include placing the laundry detergent composition that has undergone the aging step (S10) into the foaming device and adjusting operating conditions of the foaming device to control the density of the laundry detergent composition.

[0067] For example, in the foaming step (S20), the laundry detergent composition may be foamed to have a density of about 0.6 g/cm³ and a viscosity of about 40,000 cps.

[0068] Hereinafter, examples are provided to facilitate understanding of the present invention. However, the following examples are merely provided for illustrative purposes, and the present invention is not limited by these examples.

Examples: Degree of Polymerization and Degree of Saponification of PVA

Example 1

[0069] A laundry detergent sheet was prepared such that, in a foaming step, a foamed laundry detergent composition had a density of 0.6 g/cm³ and a viscosity of 10,000 cps.

Example 2

[0070] A laundry detergent sheet was prepared such that, in a foaming step, a foamed laundry detergent composition had a density of 0.6 g/cm³ and a viscosity of 40,000 cps.

Example 3

[0071] A laundry detergent sheet was prepared such that, in a foaming step, a foamed laundry detergent composition had a density of 0.6 g/cm³ and a viscosity of 80,000 cps.

Test Example 1: Degree of Polymerization Evaluation

[0072] The degree of polymerization refers to the number of repeating units within a polymer molecule. In the present test example, the degree of polymerization was evaluated based on viscosity. A predetermined amount of the laundry detergent composition was poured onto a belt, and viscosity was observed. A high degree of polymerization corresponds to a high viscosity, a medium degree of polymerization corresponds to a moderate viscosity, and a low degree of polymerization corresponds to a low viscosity.

Test Example 2: Degree of Saponification Evaluation

[0073] The degree of saponification refers to a degree of hydrolysis of polyvinyl alcohol (PVA). PVA is produced by hydrolyzing polyvinyl acetate (PVAc), which is an intermediate product. When PVA is completely hydrolyzed, it does not readily dissolve in water at room temperature. Accordingly, it is preferable to control the degree of hydrolysis to obtain PVA that is readily soluble in water even at room temperature. When the degree of saponification is high (greater than 98%), PVA tends to be poorly soluble in water at room temperature. In contrast, when the degree of saponification is within a range of 88% to 98%, PVA exhibits good solubility in water.

Table 5

Category	Degree of Polymerization	Degree of Saponification (%)
Example 1	Low	88-98
Example 2	Medium	88-98
Example 3	High	80-91

[0074] As shown in Table 5, when the viscosity is less than 30,000 cps, the laundry detergent composition flows too rapidly, making it difficult to form a sheet having a uniform thickness, and is therefore not suitable. When the viscosity exceeds 50,000 cps, flowability is poor, resulting in difficulty in forming a sheet on a conveyor belt, and is therefore not suitable. Accordingly, a viscosity in a range of 30,000 to 50,000 cps is most desirable.

[0075] Through this configuration, the laundry detergent sheet manufacturing method according to the present invention allows the degree of polymerization and the degree of saponification of PVA to be appropriately maintained, thereby facilitating formation of a sheet having a uniform thickness. In addition, by maintaining a suitable degree of saponification of 88% to 98%, the laundry detergent sheet may exhibit improved cleaning performance, solubility, and flexibility, resulting in satisfactory performance.

[0076] In the coating step (S30), the foamed laundry detergent composition obtained through the foaming step (S20) may be placed into a coating liquid tank of a comma coater and applied onto a release film at a predetermined thickness.

[0077] The coating step (S30) may be performed using a coating apparatus. For example, the coating step (S30) may be performed using one selected from the group consisting of a comma coater, knife coater, roll coater, spin coater, direct coater, and three-roll reverse coater.

[0078] The coating step (S30) may be performed to apply the composition at a thickness of 0.3 to 3.8 mm using the release film. For example, the coating step (S30) may be performed by maintaining a gap of about 2.0 mm while applying the composition onto the release film. Through this configuration, the layer of the laundry detergent sheet 1 may be protected from external factors, and peeling during product use may be facilitated. As a result, the sheet material may be well maintained during the manufacturing process, and subsequent peeling may be performed more conveniently.

[0079] In the drying step (S40), the release film coated with the laundry detergent composition through the coating step (S30) may be placed into a dryer to dry only the purified water, thereby forming the laundry detergent composition applied on the release film into a sheet material.

[0080] The drying step (S40) may be performed by placing the coated laundry detergent composition into the dryer to remove the purified water contained in the composition. For example, in the drying step (S40), the purified water in the laundry detergent composition may be dried to form the composition into a sheet material.

[0081] The drying step (S40) may be performed by setting a dryer temperature to 40 to 210°C and a drying speed to 0.3 to 6 m/min. For example, the drying step (S40) may be performed at a temperature of about 100°C and a drying speed of about 5 m/min to dry the purified water contained in the laundry detergent composition.

[0082] In the peeling step (S50), the laundry detergent composition that has been maintained in a sheet form and from which the purified water has been removed through the drying step (S40) may be peeled from the release film.

[0083] For example, in the peeling step (S50), the release film may be peeled from the sheet material obtained through the drying step (S40). The release film may be a silicone-based release film.

[0084] In the peeling step (S50), the peeled sheet material may have a thickness of 0.3 to 3.8 mm and a density of 0.03 to 0.35 g/cm³. For example, the peeled sheet material may have a thickness of about 2.0 mm and a density of about 0.2 g/cm³.

[0085] In the lamination step (S60), water may be sprayed in a mist form onto the laundry detergent composition that has been formed into a sheet form through the peeling step (S50), and one to ten sheets may be stacked and then placed into a dryer to laminate a plurality of sheet-type laundry detergent compositions.

[0086] For example, in the lamination step (S60), water may be sprayed in a mist form onto one surface of each of a plurality of sheet materials, two to eight sheets may be stacked to form a roll, and the stacked sheets may be laminated together while drying the sprayed water using a dryer.

[0087] The dryer used in the lamination step (S60) may be operated at a temperature of 50 to 130°C.

[0088] Although embodiments of the present invention have been described above, the present invention is not limited to the embodiments described herein. A person having ordinary skill in the art will readily appreciate that various modifications, additions, substitutions, or deletions of components may be made without departing from the spirit and scope of the present invention, and such modifications are also intended to fall within the scope of the present invention.

Claims

1. A sheet type laundry detergent manufacturing method, comprising:

an aging step of aging a laundry detergent composition in an aging room, the laundry detergent composition being prepared by including purified water, polyvinyl alcohol (PVA), polyvinylpyrrolidone (PVP), starch, and a surfactant;

a foaming step of foaming the laundry detergent composition that has undergone the aging step using a foaming device such that the laundry detergent composition has a density of 0.1 to 0.9 g/cm³ and a viscosity of 25,000 to 55,000 cps;

a coating step of placing the foamed laundry detergent composition into a coating liquid tank of a comma coater and applying the composition onto a release film at a predetermined thickness;

a drying step of placing the release film coated with the laundry detergent composition into a dryer to dry only the purified water, thereby forming the laundry detergent composition applied on the release film into a sheet material;

a peeling step of peeling the laundry detergent composition, which is maintained in a sheet form and from which the purified water has been removed through the drying step, from the release film; and

a lamination step of spraying water in a mist form onto the laundry detergent composition that has been formed into a sheet form through the peeling step, stacking one to ten sheets, and then placing the stacked sheets into the dryer to laminate a plurality of sheet-type laundry detergent compositions.

2. The method of claim 1,

wherein the laundry detergent composition comprises, based on a total weight of the composition:

7 to 17 wt% of the PVA;

2 to 8 wt% of the PVP; and

2 to 8 wt% of the starch.

3. The method of claim 2,

wherein the surfactant comprises:

40 to 60 wt% of AOS-1416, which is an anionic surfactant;

2 to 8 wt% of PCG, which is an anionic surfactant; and

6 to 14 wt% of APG, which is a nonionic surfactant.

4. The method of claim 2,

further comprising:

0.1 to 0.6 wt% of sodium benzoate;

0.3 to 1.5 wt% of sodium citrate;
0.3 to 1.5 wt% of citric acid; and
1 to 6 wt% of salt.

- 5 **5.** The method of claim 2,
further comprising:
- 0.3 to 3 wt% of a natural soap component;
0.3 to 3 wt% of a silk extract;
10 0.5 to 6 wt% of cyclodextrin; and
0.5 to 6 wt% of a plurality of enzymes.
- 6.** The method of claim 1,
wherein the aging step comprises aging the laundry detergent composition for 2 to 50 hours at a temperature of 25 to
15 70°C.
- 7.** The method of claim 1,
wherein the coating step comprises applying the laundry detergent composition at a thickness of 0.3 to 3.8 mm.
- 20 **8.** The method of claim 1,
wherein the drying step comprises drying the purified water by setting a dryer temperature to 40 to 210°C and a drying
speed to 0.3 to 6 m/min.
- 9.** The method of claim 1,
25 wherein, in the peeling step, the peeled sheet material has:
- a thickness of 0.3 to 3.8 mm; and
a density of 0.03 to 0.35 g/cm³.
- 30 **10.** The method of claim 1,
wherein, in the lamination step, the dryer is operated at a temperature of 50 to 130°C.

35

40

45

50

55

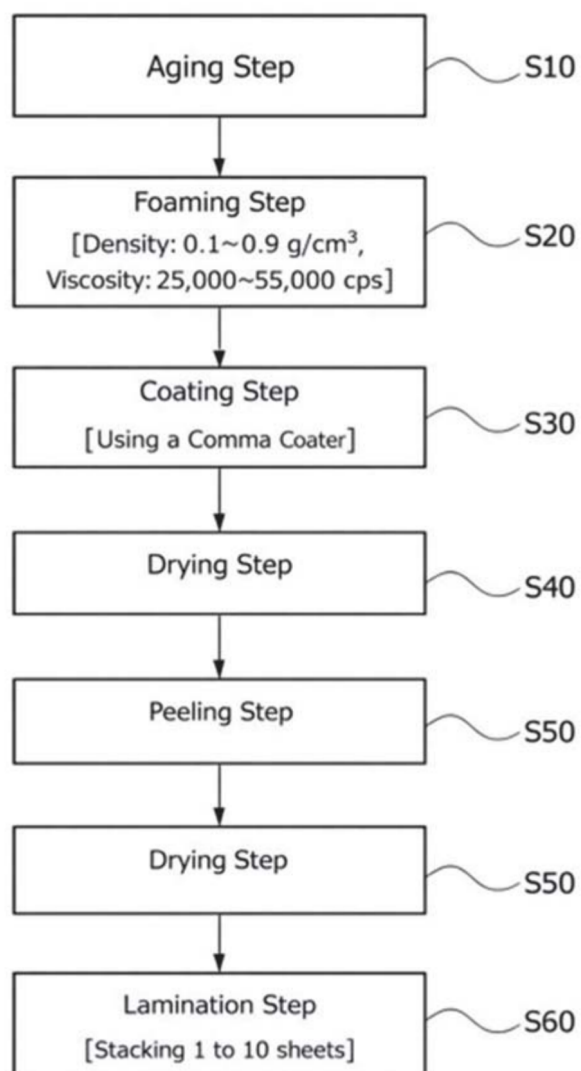


FIG. 1

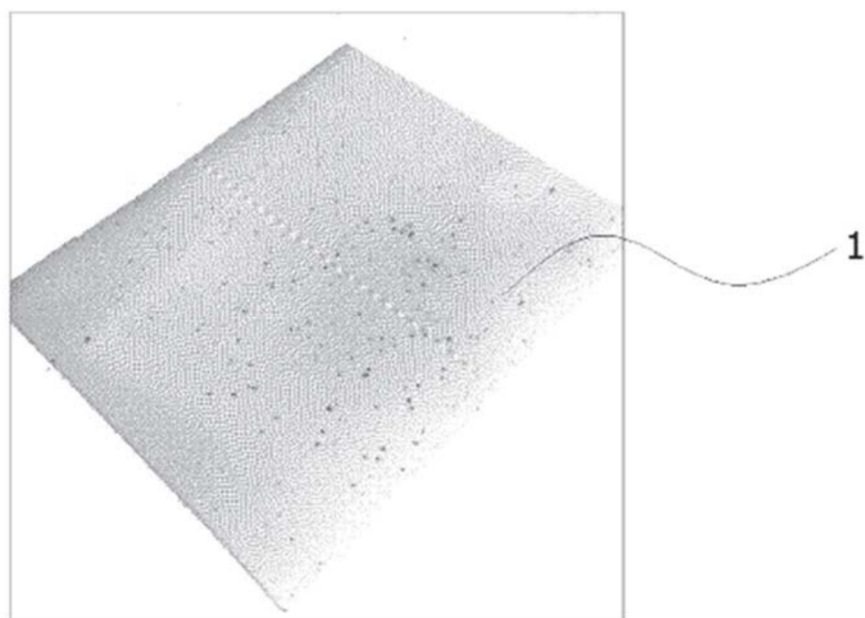


FIG. 2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2024/006219

A. CLASSIFICATION OF SUBJECT MATTER

C11D 17/06(2006.01)i; C11D 3/22(2006.01)i; C11D 3/37(2006.01)i; C11D 3/20(2006.01)i; C11D 3/04(2006.01)i;
C11D 3/386(2006.01)i; C11D 1/83(2006.01)i

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)

C11D 17/06(2006.01); A61K 8/02(2006.01); A61K 8/37(2006.01); C11D 1/14(2006.01); C11D 1/831(2006.01);
C11D 11/00(2006.01); C11D 3/00(2006.01); C11D 3/34(2006.01)

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

Korean utility models and applications for utility models: IPC as above

Japanese utility models and applications for utility models: IPC as above

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

eKOMPASS (KIPO internal) & keywords: 세정(washing), 시트(sheet), 필름(film), 숙성(aging), 발포(foam), 도포(coat), 건조
(dry), 박리(release), 합지(ply, laminate), 계면활성제(surfactant)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2013-0178407 A1 (HENKEL AG & KGAA) 11 July 2013 (2013-07-11) See claims 1-4; and paragraphs [0005]-[0014] and [0110]-[0253].	1,7-10
Y		2-6
Y	US 2004-0071755 A1 (FOX, P. S.) 15 April 2004 (2004-04-15) See claims 1-3; and paragraphs [0013]-[0047].	2-6
Y	KR 10-2020-0079334 A (THE PROCTER & GAMBLE COMPANY) 02 July 2020 (2020-07-02) See claims 1, 4 and 10; and paragraphs [0134]-[0148].	3
Y	KR 10-2073817 B1 (KIM, Dae Song et al.) 05 February 2020 (2020-02-05) See claims 1 and 5; and paragraph [0036].	4
Y	KR 10-1987-0002242 A (COLGATE PALMOLIVE CO.) 30 March 1987 (1987-03-30) See claims 11 and 12.	4

☒ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“D” document cited by the applicant in the international application

“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

“&” document member of the same patent family

Date of the actual completion of the international search

14 August 2024

Date of mailing of the international search report

16 August 2024

Name and mailing address of the ISA/KR

Korean Intellectual Property Office
Government Complex-Daejeon Building 4, 189 Cheongsaro, Seo-gu, Daejeon 35208

Facsimile No. +82-42-481-8578

Authorized officer

Telephone No.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2024/006219

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	JP 7084165 B2 (NIPPON FINE CHEMICAL CO., LTD.) 14 June 2022 (2022-06-14) See paragraphs [0017]-[0030].	5

EP 4 741 481 A1

INTERNATIONAL SEARCH REPORT Information on patent family members

International application No.

PCT/KR2024/006219

5

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
US 2013-0178407 A1	11 July 2013	DE 102006047229 A1	10 April 2008
		EP 2069471 A1	17 June 2009
		EP 2069471 B1	13 June 2012
		EP 2069471 B2	10 August 2022
		ES 2387688 T3	28 September 2012
		ES 2387688 T5	28 October 2022
		PL 2069471 T3	30 November 2012
		PL 2069471 T5	05 December 2022
		US 2009-0249558 A1	08 October 2009
		WO 2008-040619 A1	10 April 2008
US 2004-0071755 A1	15 April 2004	AU 2003-277310 A1	04 May 2004
		AU 2003-277310 A8	04 May 2004
		EP 1556006 A2	27 July 2005
		EP 1556006 A4	19 August 2009
		JP 2006-502292 A	19 January 2006
		US 2005-0069575 A1	31 March 2005
		US 6800295 B2	05 October 2004
		US 7387787 B2	17 June 2008
		WO 2004-032859 A2	22 April 2004
		WO 2004-032859 A3	05 August 2004
KR 10-2020-0079334 A	02 July 2020	CA 3086822 A1	01 August 2019
		CN 111511889 A	07 August 2020
		EP 3743500 A1	02 December 2020
		JP 2021-507055 A	22 February 2021
		KR 10-2432706 B1	18 August 2022
		US 2019-0233782 A1	01 August 2019
		WO 2019-147531 A1	01 August 2019
KR 10-2073817 B1	05 February 2020	KR 10-2020-0009769 A	30 January 2020
KR 10-1987-0002242 A	30 March 1987	AT 395168 B	12 October 1992
		AT A205586 A	15 February 1992
		AU 1987-73686 A	12 February 1987
		AU 590893 B2	23 November 1989
		BE 905218 A	04 February 1987
		BR 8603677 A	10 March 1987
		CA 1280663 C	26 February 1991
		CH 671027 A5	31 July 1989
		DE 3625268 A1	05 February 1987
		DK 167028 B1	16 August 1993
		DK 373386 A	06 February 1987
		EG 17940 A	30 March 1991
		ES 2000832 A6	16 March 1988
		FR 2585720 A1	06 February 1987
		FR 2585720 B1	21 September 1990
		GB 2180551 A	01 April 1987
		GB 2180551 B	18 October 1989
		GR 862053 B	06 March 1987
		HK 2393 A	21 January 1993
		IT 1196563 B	16 November 1988
		KR 10-1994-0010116 B1	21 October 1994
		LU 86543 A1	06 March 1987

Form PCT/ISA/210 (patent family annex) (July 2022)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2024/006219

5

10

15

20

25

30

35

40

45

50

55

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
		MX 163788 B	22 June 1992
		NL 8601997 A	02 March 1987
		NO 168951 B	13 January 1992
		NO 168951 C	22 April 1992
		NO 863144 L	06 February 1987
		PH 23581 A	11 September 1989
		PT 83122 A	01 September 1986
		PT 83122 B	29 July 1988
		SE 8603266 L	06 February 1987
		SG 108992 G	24 December 1992
		US 4767558 A	30 August 1988
		ZW 15186 A1	16 September 1987
JP 7084165 B2	14 June 2022	JP 2019-156727 A	19 September 2019