(12) UK Patent (19) GB (11) 2629552 (13) B

(45) Date of B Publication **23.04.2025**

(54) Title of the Invention: Detergent sheet

(51) INT CL: ***C11D 1/94*** (2006.01) ***C11D 1/83*** (2006.01) ***C11D 3/22*** (2006.01) ***C11D 3/37*** (2006.01)
C11D 3/386 (2006.01) ***C11D 3/60*** (2006.01) ***C11D 17/00*** (2006.01)

(21) Application No: **2412164.2**

(22) Date of Filing: **21.12.2022**

Date Lodged: **19.08.2024**

(86) International Application Data:
PCT/CN2022/140598 Zh 21.12.2022

(87) International Publication Data:
WO2024/130580 Zh 27.06.2024

(43) Date of Reproduction by UK Office **30.10.2024**

(56) Documents Cited:
WO 1999/033946 A1
CN 114395448 A
TW 201732030 A
CN 115362245 A
CN 112041418 A
US 20110015153 B2

(58) Field of Search:
As for published application 2629552 A viz:
INT CL **C11D**
Other: **CNABS, DWPI, VEN, CNTXT, WOTXT, EPTXT, USTXT, CNKI**
updated as appropriate

Additional Fields
Other: **None**

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GB 2629552 B

DETERGENT SHEET

FIELD OF TECHNOLOGY

[0001] The present application relates to the technical field of detergents, and specifically relates to a detergent sheet.

BACKGROUND

[0002] With high content of active ingredients, solid flake-like detergents (detergent sheets) have been increasingly favored and used by young consumer groups, business and traveling consumer groups due to their advantages in concentration, storage, transportation, and portability. Despite of the above advantages, the detergent sheet performs not so well in terms of detergency which is of high concern by customers, especially for daily stubborn stains such as protein and milk stains. Drying process of the detergent sheet will evaporate water such that products contain very low content of water and even hardly contain water, and thus, have high concentration and portability. However, the temperature is high in the process of water drying; and high temperature inactivates an enzyme preparation with special functions in the drying process such that the decontamination capacity is weakened greatly, resulting in the loss of original decontamination property and leading to the failure of removal of the daily stubborn stains such as protein and milk stains.

[0003] Additionally, in the way of adding a liquid enzyme preparation to a detergent sheet via spraying or smearing, the liquid enzyme preparation contains lots of water and organic solvents; when the liquid enzyme preparation is added excessively, the detergent sheet with strong water solubility will be not only dissolved, but also will become sticky and softening, thereby causing the problem of poor storage stability. Moreover, in the detergent sheet containing a liquid enzyme preparation, the enzyme preparation is exposed to the air and prone to be affected by environment temperature and humidity, e.g., high temperature and moisture. Superacid or peralkalic environment will also inactivate enzymatic preparations. Accordingly, the current enzyme-containing detergent sheet has poor stability and is hard to exhibit high detergency; therefore, there still exists room for improvement.

[0004] Furthermore, the existing detergent sheet lacks a softener component, and a softener needs to be added separately to eliminate static electricity for clothes, increasing the complexity of washing. If a cationic softener component is directly added to a detergent, it will contact an anionic surfactant in the detergent for a long time to generate mutual adsorption of different-polarity charges, causing precipitation, which will weaken the functions of the two components. Therefore, there is still a shortage of a detergent sheet that is incorporated with a softener component and simultaneously retains the capacities of decontamination and electrostatic elimination.

SUMMARY

[0005] In view of this, the present application provides a detergent sheet and a method for preparing the detergent sheet. A large number of enzyme preparations are embedded on the detergent sheet of the present invention, which can ensure the stability of the enzyme preparation. A softener is a cationic surfactant and thus, is prone to charge adsorption for precipitation when it is compounded with an anionic detergent, thus leading to reduced detergency. Even though a softener is embedded to the detergent sheet of the present invention, the detergency is not affected due to the mutual adsorption between the softener and the detergent.

[0006] The present application provides the following technical solution:

[0007] In a first aspect, the present application provides a detergent sheet, including the following components in parts by weight:

[0008] 8-34 parts of a water-soluble high-molecular polymer;

[0009] 14-50 parts of a surfactant;

[0010] 0.1-50 parts of an enzyme preparation;

[0011] 0.1-50 parts of a softener preparation;

[0012] 1-10 parts of a foam booster preparation; and

[0013] 0-30 parts of a molding promoter;

[0014] where the enzyme preparation and the softener preparation are embedded on the detergent sheet in a form of solid particles.

[0015] In some embodiments, the weight of the water-soluble high-molecular polymer in the detergent sheet is preferably 9-33 parts, 10-32 parts, 11-31 parts, 12-30 parts, 13-29 parts, 14-28 parts, 15-27 parts, 16-26 parts, 17-25 parts, 18-24 parts, 19-23 parts, 20-22 parts, or 21 parts, inclusive of any value and scope therebetween.

[0016] In some embodiments, the weight of the surfactant in the detergent sheet is preferably 16-48 parts, 18-46 parts, 20-44 parts, 22-42 parts, 24-40 parts, 26-38 parts, 28-36 parts, 30-34 parts, or 32-33 parts, inclusive of any value and scope therebetween.

[0017] In some embodiments, the weight of the enzyme preparation in the detergent sheet is preferably 0.5-50 parts, 1-50 parts, 2-48 parts, 4-46 parts, 6-44 parts, 8-42 parts, 10-40 parts, 12-38 parts, 14-36 parts, 16-34 parts, 18-32 parts, 20-30 parts, 22-28 parts, or 24-26 parts, inclusive of any value and scope therebetween.

[0018] In some embodiments, the weight of the softener preparation in the detergent sheet is preferably 0.5-50 parts, 1-50 parts, 2-48 parts, 4-46 parts, 6-44 parts, 8-42 parts, 10-40 parts, 12-38 parts, 14-36 parts, 16-34 parts, 18-32 parts, 20-30 parts, 22-28 parts, or 24-26 parts, inclusive of any value and scope therebetween.

[0019] In some embodiments, the weight of the foam booster preparation in the detergent sheet is preferably 2-9 parts, 3-8 parts, 4-6 parts, or 5 parts, inclusive of any value and scope therebetween.

[0020] In some embodiments, the weight of the molding promoter in the detergent sheet is preferably 1-28 parts, 3-26 parts, 5-24 parts, 7-22 parts, 9-20 parts, 11-18 parts, 13-16 parts, or 14-15 parts, inclusive of any value and scope therebetween.

[0021] In some embodiments, the water-soluble high-molecular polymer is selected from one or more of the following: polyvinyl alcohol, polyvinylpyrrolidone, gelatin, carrageenan, cross-linked polyacrylate, water-soluble polyacrylamide, a polymer of vinyl acetate and vinyl alcohol, starch, dextrin, polysaccharide, cellulose, modified cellulose, and microcrystalline cellulose.

[0022] In some embodiments, the water-soluble high-molecular polymer includes polyvinyl alcohol (PVA), polyvinylpyrrolidone (PVP), hydroxypropyl methyl cellulose (HPMC), and/or hydroxyethyl cellulose (HEC).

[0023] In some embodiments, the PVA may be unmodified or modified, for example, carboxylated or sulfonated, or a copolymer of vinyl alcohol or vinyl ester monomer and one or more other monomers. Preferably, the PVA is partially or completely alcoholized or hydrolyzed.

For example, PVA may be alcoholized or hydrolyzed by about 40% to about 100%, preferably, about 50% to about 95%, and more preferably, about 80% to about 92%. It is known that a degree of hydrolysis affects the temperature at which PVA begins to dissolve into water. For example, 88% hydrolysis is corresponding to a PVA solution capable of being dissolved into cold (i.e., room temperature) water, and 90% hydrolysis and above are corresponding to a PVA solution capable of being dissolved into warm water (hot water). PVA has a mean molecular weight (MW) of 20,000-120,000 and a mean degree of polymerization (DP) of 500-2,500, and more preferably, has an MW of 25,000-100,000 and a DP of 550-2,000.

[0024] In some embodiments, the PVP may be prepared using a monomer vinyl pyrrolidone via methods such as bulk polymerization and solution polymerization; it may be in a form of a homopolymer, a copolymer, and a cross-linked polymer as well as be nonionic, cationic, and anionic; preferably, any of nonionic and anionic forms, or a combination thereof, and more preferably, it is a nonionic PVP in the present application. Preferably, the mean molecular weight is within 5,000-100,0000; K value is within 15-90; and more preferably, it is a compound of nonionic PVP having a mean molecular weight of 8,000-40,0000 and a K value of 15-60 with PVA.

[0025] In some embodiments, the HPMC and/or HEC are inactive synthetic, semi-synthetic viscoelastic polymers. It is compounded with PVA to achieve a protective effect on a colloid, thus being beneficial to the film-forming property of PVA, which reduces the amount of the PVA used, increases the amount of the surfactant used, improves the available content of the product concentration property, thereby achieving the purpose of good cleaning effect at a low dose of product.

[0026] In some embodiments, the surfactant is a combination of one or two of an anionic surfactant and a nonionic surfactant.

[0027] In some embodiments, the surfactant is a composition obtained by mixing an anionic surfactant and a nonionic surfactant in a weight ratio of 10:1-6.

[0028] In some embodiments, the anionic surfactant may be selected from sulfate compounds of sulfated olefins, e.g., alkylbenzene sulfonates, α-alkenyl sulfonates, and non-alkoxylated C6-C20 linear or branched alkyl sulfates obtained after fatty acids are directly sulfated and then neutralized with an alkali; representative examples include, for example, lauryl benzene sulfonate (LAS), α-olefin sulfonate (AOS), lauryl sulfate (SLS), secondary alkane sulfonate (SAS), and fatty acid methyl ester sulfonate (MES), as well as C6-C20 linear or branched alkyl alkoxylated sulfates having a degree of weight-average oxyalkylation of 0.1-10, preferably, C10-C16 linear or branched alkyl alkoxylated sulfates having a degree of weight-average oxyalkylation of about 1 to about 5, e.g., lauryl polyether sulfates (AES), etc. but is not limited thereto.

[0029] In some embodiments, the nonionic surfactant may be selected from C6-C20 alkyl alkoxylated alcohols having a degree of weight-average oxyalkylation of 5-15, including fatty alcohols, isomeric alcohol polyoxyethylene ethers, polyoxyethylene ethers, alkylphenol ethoxylates, fatty acid ethoxylates, oily ethoxylates, alkanolamides, ethylene oxide, epoxypropane, polyethers, polyol ester ethers, and other types. Representative examples include, for example, fatty alcohol-polyoxyethylene ethers, polyoxyethylene alkyl phenylethers, polyoxyethylene alkyl ethers, polyoxyethylene-polyoxypropylene block copolymers, polyethylene glycol fatty acid esters, polyoxyethylene sorbitan fatty acid esters, cocamide monomethylamine, cocamide dimethylamine, cocamide monoethanolamine, cocamide diethanolamine, fatty acid alkanolamide, alkyl polyglucoside, methylpolyvinyl alkyl ethers, glucoside polyoxyethylene ethers, fatty acid methyl ester ethoxylates, etc., but are not limited thereto.

[0030] In some embodiments, the enzyme preparation is selected from one or more of the following: protease, amylase, lipase, cellulase, mannanase, pectate lyase, papain, oxidordeuctase, and glucoside hydrolase.

[0031] In some embodiments, the enzyme preparation may be a commercially available solid enzyme preparation, for example, a solid-phase concentric enzyme (Art. No. DX01: a complex of protease and cellulase) derived from KDN Biotech Group, a solid-phase protease (Art. No.: CLEARDENT 12.0T), a solid-phase cellulase (Art. No.: CLEARDENT C2000) as well as solid-phase cellulases (Art. No.: Careayme Premium 5000T, Art. No. Celluclean 4500T), a solid-phase amylase (Art. No. Stainzyme® Plus Evity 12T), Savinase® series of solid-phase proteases (Savinase® 4.0T/Savinase® 6.0T/Savinase® 8.0T/Savinase® 12T/Savinase® 24T) derived from Novozymes.

[0032] The enzyme preparation may be, for example, an enzyme granule prepared via a granule coated with an alkaline protease and a preparation method thereof disclosed in the Chinese patent with the publication number of CN102533708A, and a particulate enzyme composition disclosed in the Chinese patent with the publication number of CN105283534A, but is not limited thereto.

[0033] In some embodiments, the particle of the enzyme preparation has an average particle size of 0.01-3.0 mm.

[0034] In some embodiments, the particle of the enzyme preparation has an average particle size of 0.05 mm-2.8 mm, 0.1 mm-2.5 mm, 0.1 mm-2.0 mm, 0.5 mm-2.0 mm, 1 mm-2.0 mm, or 1.5 mm-1.8 mm, inclusive of any value and scope therebetween, but is not limited thereto.

[0035] In some embodiments, the softener preparation includes one or more of a cationic softener, an anionic softener, a nonionic softener, an amphoteric quaternary ammonium salt softener, and a silicone softener, polyethylene glycol/polypropylene glycol, and a molding promoter.

[0036] In some embodiments, the particle of the softener preparation has an average particle size of 0.01 mm-3.0 mm.

[0037] In some embodiments, the particle of the softener preparation has an average particle size of 0.05 mm-2.8 mm, 0.1 mm-2.5 mm, 0.1 mm-2.0 mm, 0.5 mm-2.0 mm, 1 mm-2.0 mm, or 1.5 mm-1.8 mm, inclusive of any value and scope therebetween, but is not limited thereto.

[0038] In some embodiments, the softener preparation includes a cationic softener, polyethylene glycol/polypropylene glycol, and a molding promoter.

[0039] In some embodiments, the softener preparation includes a cationic softener, a silicone softener, polyethylene glycol/polypropylene glycol, and a molding promoter.

[0040] In some embodiments, the softener preparation includes a cationic softener, a natural or synthetic cationic cellulose polymer softener, polyethylene glycol/polypropylene glycol, and a molding promoter. The cationic softener may be specifically selected from one or more of the following: alkyldimethyl ammonium chloride, alkylimidazoline salts, alkylamido quaternary ammonium salts, and ester quaternary ammonium salt compounds. The natural or synthetic cationic cellulose polymer softener is selected from one or more of the following:

guar gum hydroxypropyltrimethyl ammonium chloride, hydroxypropyl guar gum hydroxypropyltrimethyl ammonium chloride, chitosan, polyquaternary ammonium salt-10, polyquaternary ammonium salt-6, polyquaternary ammonium salt-7, polyquaternary ammonium salt-39, and polyquaternary ammonium salt-6. The polyquaternary ammonium salt series is preferably polyquaternary ammonium salt-10.

[0041] In some embodiments, the silicone softener is selected from one or more of the following: dimethyl siloxane, polydimethylsiloxane, amino-modified polysiloxane, polyether-modified siloxane, aminopolyether-modified siloxane, epoxypolyether-modified polysiloxane, and linear block polyether-modified siloxane.

[0042] In some embodiments, the molding promoter may be water-soluble, insoluble organic matters, inorganic salts, etc. Specifically, the molding promoter is selected from one or more of the following: bentonite, kaolin, sodium sulfate, neutral sodium silicate, sodium pyrophosphate, sodium borate, talcum powder, silicon dioxide, zeolite 4A, starch, cellulose, dextrin, and polysaccharides.

[0043] In some embodiments, the polyethylene glycol/polypropylene glycol has a weight-average molecular weight of 2,000-20,000.

[0044] In some embodiments, the polyethylene glycol/polypropylene glycol has a weight-average molecular weight of 3000-20000, 4000-18000, 5000-15000, 6000-13000, 7000-12000, 8000-11000, 9000-10000, inclusive of any value and scope therebetween.

[0045] In some embodiments, the softener preparation includes the following components in parts by weight:

[0046] 3-60 parts of polyethylene glycol/polypropylene glycol;

[0047] 1-60 parts of a cationic softener; or/and

[0048] 1-10 parts of a silicone softener;

[0049] 1-90 parts of bentonite;

[0050] 1-50 parts of starch; and

[0051] 1-10 parts of dextrin.

[0052] In some embodiments, the softener preparation may be prepared by a fluidized bed spray drying method, a pressure spray drying method, an air-flowing spray drying method, a vertical scraper film drying method, a turbulent tubular drying method, a horizontal scraper film flash drying method, and a rotary drum drying method, but is not limited thereto.

[0053] In some embodiments, the foam booster preparation is a mixture consisting of one or more of an anionic surfactant, a zwitterionic surfactant, a nonionic surfactant and water. Specifically, the foam booster preparation is a mixture consisting of at least one of potassium laurate, triethanolamine dodecylbenzene sulfonate, sodium laureth sulfate, triethanolamine polyoxyethylene alkylether phosphate, alkyl glycoside having a carbon chain distributed between C8 and C16, C10-C16 alkanolamide, fatty acid monoethanolamide and fatty acid diethanolamide, alkyldimethylamine oxide, alkylacylpropyl betaine, cocamidopropyl hydroxyl sulphobetaine, sodium alkylamideamphoacetate and C12-C16 olefin sulfonate, and deionized water or distilled water having a conductivity of less than 10 us/cm.

[0054] In some embodiments, the foam booster preparation includes the following components in parts by weight:

[0055] 1-4 parts of potassium laurate;

[0056] 6-14 parts of triethanolamine dodecylbenzene sulfonate;

[0057] 2-8 parts of C12-C16 olefin sulfonate;

[0058] 5-11 parts of triethanolamine polyoxyethylene alkylether phosphate;

[0059] 6-14 parts of alkyl glycoside;

[0060] 2-6 parts of cocamidopropyl hydroxyl sulphobetaine; and

[0061] 30-90 parts of deionized water.

[0062] In some embodiments, the foam booster preparation may be prepared by the following methods: 60.5 parts of deionized water/distilled water were added to a mixing pot, and then 2.5 parts of potassium laurate, 10 parts of triethanolamine dodecylbenzene sulfonate, 5 parts of C12-C16 olefin sulfonate, 8 parts of triethanolamine polyoxyethylene alkylether phosphate, 10 parts of C12-C16 alkyl glycoside, 4 parts of cocamidopropyl hydroxyl sulphobetaine are added in turn, stirred and dissolved evenly to obtain the foam booster preparation.

[0063] In some embodiments, the detergent sheet further includes one or more of the following: a dye inhibitor, an essence, glycerol, propanediol, butanediol, pentanediol, mannitol, hydroxyethyl urea, glycosylglycerol, tetrasodium glutamate diacetate, sodium bicarbonate, sodium iminodisuccinate, sodium polyaspartate, sodium polyepoxysuccinate, and trisodium methylglycine diacetate.

[0064] In some embodiments, the dye inhibitor is selected from one or more of the following: cationic dye inhibitors, nonionic dye inhibitors, and inorganic salt dye-fixing agents; specifically, one or more of the following: cationic dye inhibitors of imidazolines, quaternary ammonium salts, aliphatic polyamine derivatives, inorganic salts (e.g., bentonite) and celluloses, and nonionic dye inhibitors of PVP, modified vinylpyrrolidone/vinylimidazole copolymers. Preferably, the dye inhibitor is one or more of a mixture of PVP with a modified vinylpyrrolidone/vinylimidazole copolymer, an aliphatic polyamine derivative, and polyquaternary ammonium cellulose; and more preferably, a combination of PVP with a modified vinylpyrrolidone/vinylimidazole copolymer (10:1-10).

[0065] In some embodiments, the detergent sheet further includes a foam booster for frothing and may be selected from an inorganic foam booster and an organic foam booster. The inorganic foam booster may be a mixture of any one or two of sodium carbonate and sodium bicarbonate.

[0066] In some embodiments, particles of the enzyme preparation and softener preparation in the present invention may be a spherical, rod-like, plate-like, tubular, square, rectangular, disc-like, starlike, or regular or irregular flake in appearance.

[0067] In a second aspect, the present application provides a method for preparing a detergent sheet, including the following steps:

[0068] 1) dissolving a water-soluble high-molecular polymer into deionized water for preparing a film-forming solution of the detergent sheet;

[0069] 2) adding a surfactant, a foam booster preparation component and/or a molding promoter successively, stirring and mixing well, heating and drying to obtain a semi-solid sheet; and

[0070] 3) distributing an enzyme preparation and a softener preparation in a form of solid particles onto the semi-solid sheet heated continuously in the step 2), drying and forming to obtain the detergent sheet.

[0071] In conclusion, the present application includes the following at least one of beneficial technical effects:

[0072] 1. The detergent sheet of the present application has a higher content of enzyme preparation and softener preparation and thus, has obvious advantages in the aspects of detergency and electrostatic elimination capacity. With higher content of enzyme, the present invention has an excellent cleaning effect on daily stubborn stains such as protein, milk and blood stains. Moreover, the present invention is not only suitable for clothes, but also can be used in a dish-washing machine environment for cleaning dishes. With higher content of softener preparation, the detergent sheet of the present application can achieve dual effects of clothes cleaning and softening simultaneously.

[0073] 2. The present application makes use of the non-volatile stability of the solid-phase enzyme preparation. The solid-phase enzyme preparation and coated softener component are added onto the continuously dried detergent sheet preparation via the transmission of a mechanical device such that the solid-phase enzyme preparation and the coated softener component can be added at a maximum dose while being dried, thereby preventing the stability of the detergent sheet preparation from being affected by temperature and humidity environment; and the solid-phase enzyme preparation and solid-phase softener preparation are absorbed on the drying sheet more stably. Meanwhile, the present application meets the plastic-free packaging requirements and reduces white pollution such that the product meets the requirements of environmental protection more. Furthermore, mechanical rotary speed is regulated via variable frequency; the amount of the solid-phase enzyme preparation and the coated softener preparation is controlled flexibly, and can be configured flexibly according to different washing objects; therefore, the present application is suitable for large-scale production.

[0074] 3. A foam booster preparation is adopted and compounded with the detergent components such that slurry achieves increased volume, decreased density, lightened weight and a loose inner structure during the sheet making process. Sheet detergent slurry is dried rapidly during sheet making process, thereby reducing and avoiding the influences of the drying temperature on the stability of the solid-phase enzyme preparation and the coated solid-phase softener preparation. Meanwhile, the lightweight slurry with small density and loose inner structure enables the components of the enzyme preparation to be added to the continuously dried slurry in a high dose more easily. When moisture is evaporated continuously, the solid-phase enzyme preparation and the solid-phase softener preparation are absorbed on the sheet more tightly, not easy to shed off, thereby forming a stable detergent sheet with strong detergency and softening performance.

[0075] 4. A foam booster preparation and a foaming agent are simultaneously applied such that slurry has a loose inner structure; the molecular chain of the water-soluble high-molecular polymer for forming a film is prone to disconnection or disassembly in the water-containing slurry; the stability and shedding-proof property of the components of the detergent granular composition and the solid-phase softener preparation will be not affected even though auxiliary ingredients are added to the components of the detergent sheet. Meanwhile, the addition of auxiliaries not only facilitates the drying of slurry more easily, but also reduces the water content of the dried detergent sheet, and is beneficial to enhancing the stability performance of the detergent sheet for the convenience of storage due to reduced moisture content.

[0076] 5. The high molecular weight properties of polyethylene glycol/polypropylene glycol are utilized such that the polyethylene glycol/polypropylene glycol and the coated cationic softener component are dissolved slowly, which thus avoids the mutual effect caused by the electrostatic adsorption precipitation with strong anionic detergent components in the first washing procedure. The sheet containing anionic detergent components and solid-phase enzyme preparation are first dissolved to wash clothes; and then in the rinsing procedure, polyethylene glycol/polypropylene glycol and the coated cationic softener component begin to dissolve and release the cationic softener component to contact clothes. The present application can not only neutralize the residues of the anionic detergent on clothes in time, but also can enable the clothes washed by the detergent to be repaired by the softener quickly, which really achieves the effects of clothes cleaning and softening.

DESCRIPTION OF THE EMBODIMENTS

[0077] The technical solution of the present application will be further described in detail with reference to the accompanying drawings and examples. Examples are not construed as limiting the present application, but are merely to interpret the present application.

[0078] Materials used in the examples may be commercially available unless otherwise specified. As for the detailed operating steps, experimental conditions, used instrument or apparatus not specified in the examples, those skilled in the art may make a conventional selection; these fall within the scope of the present application.

[0079] Preparation Example

[0080] Enzyme preparation particle

[0081] The enzyme preparation used in the examples and Comparative Examples of the present application is an enzyme preparation A: solid-phase concentric enzyme (Art. No. DX01) which is a complex of protease and cellulase derived from KDN Biotech Group and an enzyme preparation B: solid-phase protease Savinase® 8.0T, derived from Novozymes.

[0082] Preparation of the softener preparation particle

[0083] The softener preparation particles used in the examples and Comparative Examples of the present application were prepared by the following method: 40 kg polyethylene glycol/polypropylene glycol were added to a heating mixing pot and heated up to a liquid state; 40 kg cationic softener, 5 kg silicone softener, 45 kg bentonite, 25 kg starch, and 5 kg dextrin were added successively stirred and mixed well, and subjected to extrusion cooling or spray drying to obtain an irregular solid-phase softener preparation.

[0084] Preparation of foam booster preparation

[0085] The foam booster preparations used in the examples and Comparative Examples of the present application were prepared by the following method: 60.5 kg deionized water/distilled water were added to a mixing pot, and then 2.5 kg potassium laurate, 10 kg triethanolamine dodecylbenzene sulfonate, 5 kg C12-C16 olefin sulfonate, 8 kg triethanolamine polyoxyethylene alkylether phosphate, 10 kg C12-C16 alkyl glycoside, and 4 kg cocamidopropyl hydroxyl sulphobetaine were added successively, stirred and dissolved well to obtain the foam booster preparation.

[0086] Example

[0087] Example 1

[0088] This example provides a detergent sheet, including the following components:

[0089] 8 kg water-soluble high-molecular polymer (specifically 6 kg PVA, 1 kg PVP, and 1 kg HPMC), 14 kg surfactant (specifically 12 kg SDS and 2 kg fatty alcohol-polyoxyethylene ether AEO9), 2 kg enzyme preparation, 2 kg softener preparation, 1 kg foam booster preparation, 5 kg molding promoter, 0.1 kg dye inhibitor, 1 kg tetrasodium glutamate diacetate, 0.2 kg essence, 0.2 kg sodium bicarbonate, and 3 kg glycerol.

[0090] The detergent sheet in the present example was prepared by the following method:

[0091] 1) 8 kg water-soluble high-molecular polymer were dissolved into 50 kg deionized water, heated up to 80°C -90°C, stirred well and used for preparing a film-forming solution of the detergent sheet;

[0092] 2) 14 kg surfactant, 1 kg foam booster preparation component, 5 kg molding promoter (specifically starch/bentonite), 0.1 kg dye inhibitor, 1 kg tetrasodium glutamate diacetate, 0.2 kg essence, 0.2 kg sodium bicarbonate, and 3 kg glycerol were added successively, stirred and mixed well, heated and dried to obtain a semi-solid sheet;

[0093] 3) 2 kg of the enzyme preparation and 2 kg of the softener preparation in a form of solid particles prepared in the Preparation Example were distributed onto the continuously heated semi-solid sheet prepared in the step 2), dried and formed to obtain the detergent sheet.

[0094] Examples 2-8

[0095] The detergent sheets in the Examples 2-8 were prepared according to the method disclosed in Example 1 based on the composition of the detergent sheet in each example of Table 1.

[0096] Comparative Examples 1-2 and 5-6

[0097] The detergent sheets in the Comparative Examples 1-2 and 5-6 were prepared according to the method disclosed in Example 1 based on the composition of the detergent sheet in each Comparative Example of Table 2.

[0098] Comparative Example 3

[0099] The content of each component in the Comparative Example is shown in Table 2.

[0100] The detergent sheet in the Comparative Example was prepared by the following method:

[0101] 1) 29.5 kg water-soluble high-molecular polymer were dissolved into 60 kg deionized water, heated up to 80°C - 90°C, stirred well and used for preparing a film-forming solution of the detergent sheet;

[0102] 2) 39 kg surfactant, 1 kg foam booster preparation component, 10 kg molding promoter (specifically starch/bentonite), 0.6 kg dye inhibitor, 1 kg tetrasodium glutamate diacetate, 0.5 kg essence, 0.7 kg sodium bicarbonate, and 5 kg glycerol were added successively, stirred and mixed well, heated and dried to obtain a semi-solid sheet;

[0103] 3) 5 kg of the softener preparation in a form of solid particle were distributed onto the continuously heated semi-solid sheet, dried, formed and demolded to obtain the solid sheet; and

[0104] 4) 25 kg enzyme preparation was added to a proper amount of mixture of glycerol, propylene glycol and water, dissolved and fully stirred to obtain an enzyme preparation solution, and the enzyme preparation solution was sprayed onto the solid sheet to obtain the detergent sheet.

[0105] Comparative Example 4

[0106] The content of each component in the Comparative Example is shown in Table 2.

[0107] The detergent sheet in the Comparative Example was prepared by the following method:

[0108] 1) 29.5 kg water-soluble high-molecular polymer were dissolved into 60 kg deionized water, heated up to 80°C -90°C, stirred well and used for preparing a film-forming solution of the detergent sheet;

[0109] 2) 25 kg enzyme preparation were added to water and dissolved, and fully stirred well to obtain an enzyme preparation solution;

[0110] 3) the enzyme preparation solution prepared in 2) was added to the film-forming solution prepared in 1); 39 kg surfactant, 1 kg foam booster preparation component, 10 kg molding promoter (specifically starch/bentonite), 0.6 kg dye inhibitor, 1 kg tetrasodium glutamate diacetate, 0.5 kg essence, 0.7 kg sodium bicarbonate, and 5 kg glycerol were added successively, stirred and mixed well, heated and dried to obtain a semi-solid sheet; and

[0111] 3) 5 kg of the softener preparation in a form of solid particle were distributed onto the continuously heated semi-solid sheet prepared in the step 2), dried and formed to obtain the detergent sheet.

[0112] Comparative Example 7

[0113] The content of each component in the Comparative Example is shown in Table

2.

[0114] The detergent sheet in the Comparative Example was prepared by the following method:

[0115] 1) 29.5 kg water-soluble high-molecular polymer were dissolved into 60 kg deionized water, heated up to 80°C-90°C, stirred well and used for preparing a film-forming solution of the detergent sheet;

[0116] 2) 39 kg surfactant, 1 kg foam booster preparation component, 10 kg molding promoter (specifically starch/bentonite), 0.6 kg dye inhibitor, 1 kg tetrasodium glutamate diacetate, 0.5 kg essence, 0.7 kg sodium bicarbonate, and 5 kg glycerol were added successively, stirred and mixed well, heated and dried to obtain a semi-solid sheet;

[0117] 3) 25 kg of the enzyme preparation in a form of solid particle were distributed onto the continuously heated semi-solid sheet, dried, formed and demolded to obtain the solid sheet; and

[0118] 4) 5 kg softener preparation were added to a proper amount of mixture of glycerol and propylene glycol, dissolved and fully stirred well to obtain a softener preparation solution, and the softener preparation solution was sprayed onto the solid sheet to obtain the detergent sheet.

[0119] Comparative Example 8

[0120] The content of each component in the Comparative Example is shown in Table 2.

[0121] The detergent sheet in the Comparative Example was prepared by the following method:

[0122] 1) 29.5 kg water-soluble high-molecular polymer were dissolved into 60 kg deionized water, heated up to 80°C -90°C, stirred well and used for preparing a film-forming solution of the detergent sheet;

[0123] 2) 5 kg softener preparation were added to water and dissolved, and fully stirred well to obtain a softener preparation solution;

[0124] 3) the softener preparation solution prepared in 2) was added to the film-forming solution prepared in 1); 39 kg surfactant, 1 kg foam booster preparation component, 10 kg molding promoter (specifically starch/bentonite), 0.6 kg dye inhibitor, 1 kg tetrasodium glutamate diacetate, 0.5 kg essence, 0.7 kg sodium bicarbonate, and 5 kg glycerol were added successively, stirred and mixed well, heated and dried to obtain a semi-solid sheet; and

[0125] 4) 25 kg of the softener preparation in a form of solid particle were distributed onto the continuously heated semi-solid sheet prepared in the step 2), dried and formed to obtain the detergent sheet.

[0126] Comparative Example 9

[0127] The content of each component in the Comparative Example is shown in Table 2. The detergent sheet in this Comparative Example was prepared according to the method disclosed in Example 1.

[0128] Comparative Example 10

[0129] The content of each component in the Comparative Example is shown in Table 2.

[0130] The detergent sheet in the Comparative Example was prepared by the following method:

[0131] 1) 29.5 kg water-soluble high-molecular polymer were dissolved into 60 kg deionized water, heated up to 80°C -90°C, stirred well and used for preparing a film-forming solution of the detergent sheet; and

[0132] 2) 39 kg surfactant, 1 kg foam booster preparation component, 10 kg molding promoter (specifically starch/bentonite), 0.6 kg dye inhibitor, 1 kg tetrasodium glutamate diacetate, 0.5 kg essence, 0.7 kg sodium bicarbonate, and 5 kg glycerol were added successively, stirred and mixed well, and then 25 kg of the enzyme preparation in a form of solid particle and 25 kg of the softener preparation in a form of solid particle were added successively, stirred well, heated and dried to obtain a semi-solid sheet.

Table 1 Composition of the detergent sheets in Examples 1-8

Material type	Material	Example							
		1	2	3	4	5	6	7	8
Water-soluble	PVA	6	9	15	20	24	28	24	30
	PVP	1	2	3	4	5	5	10	1

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high-molecular polymer	HPMC	1	0.8	0.6	0.5	0.5	0.5	2.5	3
Anionic surfactant	SDS	12	15	16	20	24	30	24	24
	AOS	0	3	3	2	4	6	4	4
	LAS	0	0	3	1	0	0	0	0
	AES	0	2	2	1	2	0	2	2
Nonionic surfactant	Fatty alcohol-polyoxyethylene ether AEO9	2	0	2	2	3	4	3	3
	Fatty acid methyl ester ethoxy compound FMEE	0	0	1	2	3	4	3	3
	Isotridecanol polyoxyethylene ether 1309L	0	4	1	2	3	6	3	3
Dye inhibitor		0.1	0.4	0.4	0.5	0.6	1	0	0.2
Foam booster preparation		1	2	3	5	6	7	10	6
Foam booster	Sodium bicarbonate	0.2	0.4	0.5	0.6	0.7	1	0	0

Enzyme preparation	Enzyme preparation A	2	5	0	5	0	0	40	50
	Enzyme preparation B	0	0	15	0	25	15	0	0
Softener preparation		2	5	3	10	5	5	50	30
Other additives	Tetrasodium glutamate diacetate	1	2	2	1	1	1	1	0
	Essence	0.2	0.2	0.2	0.5	0.5	0.5	0	0.5
	Glycerol	3	3	5	3	5	5	0	0
Molding promoter	Starch/Bentonite	5	0	6	0	10	0	10	10
Deionized water		50	50	60	60	60	60	60	60

Table 2 Composition of the detergent sheets in Comparative Examples 1-10

Material type	Material	Comparative Example									
		1	2	3	4	5	6	7	8	9	10
Water-soluble high-molecular polymer	PVA	24	24	24	24	24	24	24	24	24	24
	PVP	5	5	5	5	5	5	5	5	5	5
	HPMC	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Anionic surfactant	SDS	24	24	24	24	24	24	24	24	24	24
	AOS	4	4	4	4	4	4	4	4	4	4
	LAS	0	0	0	0	0	0	0	0	0	0
	AES	2	2	2	2	2	2	2	2	2	2
Nonionic surfactant	Fatty alcohol-polyoxyethylene ether AEO9	3	3	3	3	3	3	3	3	3	3
	Fatty acid methyl ester ethoxy compound FMEE	3	3	3	3	3	3	3	3	3	3
	Isotridecanol polyoxyethylene ether 1309L	3	3	3	3	3	3	3	3	3	3
Dye inhibitor		0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Foam booster preparation		6	6	6	6	6	6	6	6	0	6

Foam booster	Sodium bicarbonate	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
Enzyme preparation B		0	70	25	25	25	25	25	25	25	25
Softener preparation		5	5	5	5	0	70	5	5	5	5
Other additives	Tetrasodium glutamate diacetate	1	1	1	1	1	1	1	1	1	1
	Essence	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
	Glycerol	5	5	5	5	5	5	5	5	5	5
Molding promoter	Starch/Bentonite	10	10	10	10	10	10	10	10	10	10
Deionized water		60	60	60	60	60	60	60	60	60	60

[0133] Performance testing

[0134] 1. Stability of the enzyme preparation particle and softener preparation particle: the detergent sheet was placed into a testing environment at a temperature of (25±2)°C and humidity of (40±5)%, and maintained for 48 h, and then taken up by hands such that the detergent sheet was turned over and rubbed properly to observe whether there was a shedding phenomenon of the enzyme preparation particle and softener preparation particle on the detergent sheet. Results are shown in Table 3.

[0135] 2. Moisture-proof stability: two pieces of detergent sheets were stacked up and down and put to a testing environment at a temperature of (25±2)°C and a humidity of (85±5)%, and maintained for 24 h, and then separated to observe whether there was an adhesion phenomenon between the two sheets; the adhesion phenomenon was divided into free adhesion, slight adhesion, and obvious adhesion. Results are shown in Table 3.

[0136] 3. Detergency test: in accordance with the evaluation method of the GB/T 13174-2021 *Determination of Detergency and Cycle of Washing Property for Laundry Detergents* and in combination with the evaluation criterion of the QB/T 1224-2012 *Liquid Detergent for Fabric*, the test concentration of the standard liquid detergent was 0.2% and the test concentration of the sample was 0.013% (the test concentration was 1/15 of the standard liquid detergent).

[0137] 3.1 Whiteness measurement:

[0138] Stained cloth JB-01, JB-02, and JB-03 were cut into a size of 6 cm*6 cm, and matched into six groups having similar mean blackness by category, respectively; the test piece in each group was used for the performance testing of a same sample.

[0139] The whiteness before and after washing was read at 457 nm with a whiteness meter one by one. Two points (two points on each side were central symmetry) were taken from front and back sides of the test piece before washing to measure whiteness, and a mean value of four measurements served as the whiteness before washing of the test piece F1; two points (two points on each side were central symmetry) were taken from front and back sides of the test piece after washing to measure whiteness, and a mean value of four measurements served as the whiteness after washing of the test piece F2.

[0140] A difference (F2-F1) between F2 and F1 for each test piece was calculated in a one-to-one correspondence way, and detergency of each group of test pieces was calculated. It was calculated according to the test piece for the different kinds of stained cloth, respectively to determine the detergency value R and detergency proportion of the detergent in each kind of stained cloth, and the method is as follows.

[0141] 3.2 Calculation of detergency value R of the stained cloth

[0142] Detergency value Ri of a certain stained cloth $= \Sigma(F2i-F1i)/n$;

[0143] in the formula,

[0144] i - test piece for the ith type of stained cloth;

[0145] F1i - spectral reflectivity of the test piece for the ith type of stained cloth before washing, %;

[0146] F2i - spectral reflectivity of the test piece for the ith type of stained cloth after washing, %; and

[0147] n - available content of the test piece for each group of stained cloth.

[0148] The result is retained with one decimal.

[0149] 3.3 Calculation of detergency proportion P of the stained cloth

[0150] Detergency proportion Pi in the ith type of stained cloth relative to the standard liquid detergent = R3i/R0i;

[0151] in the formula,

[0152] R0i - detergency value of the standard liquid detergent, %;

[0153] R3i - detergency value of the test sample.

[0154] The result is retained with one decimal.

[0155] 3.4 Determination of the detergency of detergent

[0156] When Pi $\geq$ 1.0, the conclusion is determined as “the sample has a detergency equivalent or superior to the standard liquid detergent”, i.e., “detergency for the ith type of stained cloth is up to standard” for short.

[0157] When Pi < 1.0, the conclusion is determined as “the sample has a detergency interior to the standard liquid detergent”, i.e., “detergency for the ith type of stained cloth is below standard” for short.

[0158] Results are shown in Table 4.

[0159] 4. Antistatic property test: in accordance with the standard of the QB/T 4535-2013 Fabric softening agent, the antistatic property of the detergent sheet was tested; it was calculated by a difference of surface resistance logarithms $\triangle \lg\rho_s$, a value of ≥ 2.5 is determined to be up to standard. Results are shown in Table 4.

Table 3 Test results of the particle stability and moisture-proof stability of the detergent sheets prepared in the examples and Comparative Examples

	Particle stability	24 h moisture-proof stability	48 h moisture-proof stability
Example 1	Shedding free	Adhesion free	Slight adhesion

Example 2	Shedding free	Adhesion free	Slight adhesion
Example 3	Shedding free	Adhesion free	Slight adhesion
Example 4	Shedding free	Adhesion free	Adhesion free
Example 5	Shedding free	Adhesion free	Slight adhesion
Example 6	Shedding free	Adhesion free	Adhesion free
Example 7	Shedding free	Adhesion free	Slight adhesion
Example 8	Shedding free	Adhesion free	Slight adhesion
Comparative Example 1	Shedding free	Adhesion free	Slight adhesion
Comparative Example 2	Shedding free	Slight adhesion	Obvious adhesion
Comparative Example 3	——	Obvious adhesion	Obvious adhesion
Comparative Example 4	——	Obvious adhesion	Obvious adhesion

Comparative Example 5	Shedding free	Adhesion free	Adhesion free
Comparative Example 6	Shedding free	Adhesion free	Adhesion free
Comparative Example 7	——	Obvious adhesion	Obvious adhesion
Comparative Example 8	——	Obvious adhesion	Obvious adhesion
Comparative Example 9	Serious shedding	Adhesion free	Adhesion free
Comparative Example 10	Shedding free	Adhesion free	Adhesion free

Table 4 Test results of the detergency and antistatic property of the detergent sheets prepared in the examples and Comparative Examples

	Detergency proportion					$\triangle \lg\rho_s$
	Test concentration	Stained cloth JB-01	Stained cloth JB-02	Stained cloth JB-03	Test result	
Standard liquid detergent	0.2%	1.00	1.00	1.00	/	/

Example 1	0.013%	1.71	3.71	1.12	Up to standard	3.9
Example 2	0.013%	1.75	3.82	1.18	Up to standard	4.1
Example 3	0.013%	1.79	3.85	1.24	Up to standard	4.3
Example 4	0.013%	1.77	3.81	1.20	Up to standard	4.2
Example 5	0.013%	1.82	3.91	1.25	Up to standard	4.1
Example 6	0.013%	1.79	3.85	1.30	Up to standard	4.0
Example 7	0.013%	1.83	3.95	1.35	Up to standard	4.6
Example 8	0.013%	1.86	3.96	1.36	Up to	4.4

					standard	
Comparative Example 1	0.013%	1.51	1.52	1.01	Up to standard	4.1
Comparative Example 2	0.013%	1.89	4.03	1.40	Up to standard	4.3
Comparative Example 3	0.013%	1.60	2.52	1.26	Up to standard	4.2
Comparative Example 4	0.013%	1.56	2.21	1.24	Up to standard	4.0
Comparative Example 5	0.013%	1.61	3.78	1.29	Up to standard	1.3
Comparative Example 6	0.013%	1.65	3.94	1.36	Up to standard	4.9
Comparative Example 7	0.013%	1.03	1.23	0.98	Below standar	2.0

					d	
Comparative Example 8	0.013%	1.02	1.21	0.96	Below standard	1.9
Comparative Example 9	0.013%	1.13	1.33	0.99	Below standard	2.0
Comparative Example 10	0.013%	1.62	3.32	1.10	Up to standard	3.8

[0160] As can be seen from the data of Table 4, with the increase of the content of the enzyme preparation, the detergency proportions against the stained cloth JB-01, JB-02, and JB-03 all increase gradually, and the detergency enhances gradually. In Comparative Example 2, the enzyme preparation had a higher content (70 kg), but achieved no obviously improved detergency relative to Example 8 (the enzyme preparation has a content of 50 kg). When the amount of the enzyme preparation added ranges from 0.1 kg to 50 kg, the detergency is obviously enhanced with the increase of the content of the enzyme preparation, in particular to the stained cloth JB-02 containing more protein stains; the detergency is obviously affected by the content of the enzyme preparation comparatively.

[0161] In Comparative Example 3, the enzyme preparation was added in the following way: an enzyme was prepared to a solution, and then sprayed onto a solid detergent sheet, and the detergency proportion to the stained cloth JB-02 was only 2.52; while in Example 1 containing the same content of enzyme preparation, the detergency proportion to the stained cloth JB-02 was 3.95. It can be seen that the detergency is much lower than that of the detergent sheet having an enzyme preparation in a form of particle. This is because the exposed liquid enzyme preparation is prone to be affected by environment temperature and humidity, thus affecting its decontamination effect. In Comparative Example 4, the enzyme preparation in a liquid form was directly mixed with other components of the detergent sheet, dried, and molded. The detergency proportion to the stained cloth JB-02 was only 2.21; while in Example 1 containing the same content of enzyme preparation, the detergency proportion to the stained cloth JB-02 was 3.95. It can be seen that the detergency is much lower than that of the detergent sheet having an enzyme preparation in a form of particle. This is because the liquid enzyme preparation is mixed directly with the detergent sheet, and drying and molding process of the detergent sheet will inactivate a part of the enzyme, thus impairing the detergency of the detergent sheet.

[0162] In Comparative Examples 3-4, the enzyme preparation in a liquid form suffers obvious adhesion in the tests of 24 h moisture-proof stability and 48 h moisture-proof stability. The detergent sheets in Examples 1-8 exhibit good stability.

[0163] As can be seen from data of Table 4, with the increase of the content of the softener preparation, the antistatic property of the fabric washed with the detergent sheet increases gradually. In Comparative Example 6, the softener particle has a higher content (70 kg), but has no obviously improved antistatic property relative to Comparative Example 7 with the addition of 50 kg softener preparation.

[0164] In Comparative Example 7, the softener was sprayed onto the semi-solid detergent sheet in a liquid form. As can be seen from the data of Table 4, the antistatic property of the fabric washed with the detergent sheet in Comparative Example 7 is only 2.0. In addition, the detergency of the detergent sheet in Comparative Example 7 is much weaker than the detergent sheet containing the same content of softener preparation in Example 1 obviously. In Comparative Example 8, the softener was directly added in a liquid form together with other components. As can be seen from the data of Table 4, the antistatic property of the fabric washed with the detergent sheet in Comparative Example 8 is only 2.0, below standard. In addition, the detergency of the detergent sheet in Comparative Example 8 is much weaker than the detergent sheet containing the same content of softener preparation in Example 1 obviously. This is because the surfactant used in the examples of the present application is an anionic/nonionic surfactant, and the used softener contains a cationic surfactant. Either the softener preparation incorporated in a spray form or the softener preparation incorporated in a way of mixing with other components of the detergent sheet directly will contact the surfactant directly; the cationic surfactant and the anionic surfactant are subjected to electrostatic adsorption to cause precipitation, weakening the efficacy of the two. In Example 1, the high molecular weight properties of polyethylene glycol/polypropylene glycol are utilized such that the polyethylene glycol/polypropylene glycol and the coated cationic softener component are dissolved slowly, which thus avoids the mutual effect caused by the electrostatic adsorption precipitation with strong anionic detergent components in the first washing procedure. The sheet containing anionic detergent components and solid-phase enzyme preparation are first dissolved to wash clothes; and then in the rinsing procedure, polyethylene glycol/polypropylene glycol and the coated cationic softener component begin to dissolve and release the cationic softener component to contact clothes. The present application can not only neutralize the residues of the anionic detergent on clothes in time, but also can enable the clothes washed by the detergent to be repaired by the softener fast, which really achieves the effects of clothes cleaning and softening.

[0165] In Comparative Examples 7-8, the softener preparation in a liquid form suffers obvious adhesion in the tests of 24 h moisture-proof stability and 48 h moisture-proof stability.

[0166] In Comparative Example 9, no foam booster is added, and the overall structure of the detergent sheet is more compact and not enough loose such that a large number of enzyme preparation particles and softener particles shed off; its detergency and antistatic property are much weaker, as compared to those in Example 5 containing a foam booster and identical other components. This is because a foam booster may loosen the inner structure of slurry such that the molecular chain of the water-soluble high-molecular polymer for forming a film is prone to disconnection or disassembly in a water-containing slurry; the stability and shedding-proof property of the components of the detergent granular composition and the solid-phase softener preparation will be not affected even though auxiliary ingredients are added to the components of the detergent sheet.

[0167] In Comparative Example 10, the enzyme preparation particle and the softener preparation particle are directly mixed with other components of the detergent sheet to prepare a detergent sheet into which the enzyme preparation particle and the softener preparation particle are totally embedded. Comparative Example 10 and Example 5 have totally the same components of the detergent sheet. The difference between the two merely lies in the positions of the enzyme preparation particle and the softener preparation particle in the detergent sheet; in Example 5, the particles are embedded on the detergent sheet, while in Comparative Example 10, the particles are embedded into the inner part of the detergent sheet. As can be seen from the test results of the detergency and antistatic property in Table 4, the detergent sheet in Comparative Example 10 has weaker detergency and antistatic property. This is because the enzyme preparation particle and the softener preparation particle are located on the surface of the detergent sheet; such a configuration may make the particles in contact with water earlier and dissolved fast, thus exerting the effects of detergency and antistatic property fast. In Comparative Example 10, the particles are evenly embedded into the inner part of the detergent sheet; the enzyme preparation particle and the softener preparation particle are not released to contact water until the overall detergent sheet is dissolved, and then the effects of detergency and antistatic property may be exerted. In a mode of quick wash of a washing machine, the configuration of embedding the enzyme preparation particle and the softener preparation particle on the detergent sheet has more obviously advantages.

[0168] The detailed examples are merely to interpret the present application, but are not construed as limiting the present application. After reading through the description, those skilled in the art can make amendments without any inventive contribution to the examples according to needs; and these amendments shall be protected by the Patent Law as long as fall within the scope of the claims of the present application.

WHAT IS CLAIMED IS:

1. A detergent sheet, comprising the following components in parts by weight:
8-34 parts of a water-soluble polymer;
14-50 parts of a surfactant;
0.1-50 parts of an enzyme preparation;
0.1-50 parts of a softener preparation;
1-10 parts of a foam booster preparation; and
0-30 parts of a molding promoter;

wherein the enzyme preparation and the softener preparation are embedded on the detergent sheet in a form of solid particles;

wherein the softener preparation comprises the following components in parts by weight:
3-60 parts of polyethylene glycol/polypropylene glycol;
1-60 parts of a cationic softener; or/and
1-10 parts of a silicone softener;
1-90 parts of bentonite;
1-50 parts of starch; and
1-10 parts of dextrin;

wherein the foam booster preparation comprises the following components in parts by weight:
1-4 parts of potassium laurate;
6-14 parts of triethanolamine dodecylbenzene sulfonate;
2-8 parts of C12-C16 olefin sulfonate;
5-11 parts of triethanolamine polyoxyethylene alkylether phosphate;
6-14 parts of alkyl glycoside;
2-6 parts of cocamidopropyl hydroxyl sulphobetaine; and
30-90 parts of deionized water.

2. The detergent sheet according to claim 1, wherein the water-soluble high-molecular polymer is selected from one or more of the following: polyvinyl alcohol, polyvinylpyrrolidone, gelatin, carrageenan, cross-linked polyacrylate, water-soluble polyacrylamide, a polymer of vinyl acetate and ethenol, starch, dextrin, polysaccharide, cellulose, modified cellulose, and

microcrystalline cellulose.

3. The detergent sheet according to claim 1, wherein the surfactant is a combination of one or two of an anionic surfactant and a nonionic surfactant.

4. The detergent sheet according to claim 1, wherein the enzyme preparation is selected from one or more of the following: protease, amylase, lipase, cellulase, mannanase, pectate lyase, papain, oxidordeuctase, and glucoside hydrolase.

5. The detergent sheet according to claim 1, wherein a particle of the enzyme preparation has an average particle size of 0.01 mm-3.0 mm.

6. The detergent sheet according to claim 1, wherein the softener preparation comprises one or more of a cationic softener, an anionic softener, a nonionic softener, an amphoteric quaternary ammonium salt softener, and a silicone softener, polyethylene glycol/polypropylene glycol, and a molding promoter.

7. The detergent sheet according to claim 1, further comprising one or more of the following: a dye inhibitor, an essence, glycerol, propanediol, butanediol, pentanediol, mannitol, hydroxyethyl urea, glycosylglycerol, tetrasodium glutamate diacetate, sodium bicarbonate, sodium iminodisuccinate, sodium polyaspartate, sodium polyepoxysuccinate, and trisodium methylglycine diacetate.

8. The detergent sheet according to claim 1, wherein the water-soluble high-molecular polymer comprises polyvinyl alcohol, polyvinylpyrrolidone, hydroxypropyl methyl cellulose, and/or hydroxyethyl cellulose.