

DESCRIPTION

Title of Invention

FOOD PACKAGING FILM, AND GIFT-BOXED SMALL ROLL OF
FOOD PACKAGING FILM

5 Technical Field

[0001] The present invention relates to a food wrapping film and an article that is a food wrapping rolled film with a box.

Background Art

10 [0002] Conventionally, food wrapping films have been widely used commercially in hotels, restaurants, and other such establishments, as well as in the home, during food storage, preparation, and the like. In recent years, a food wrapping film having a thermoplastic resin as a main component and further containing a colorant, such as a copper phthalocyanine colorant, has been proposed to make it easier to see
15 visually whether a piece of the film has become mixed in the food (Patent Literature 1).

[0003] On the other hand, additives such as plasticizers, anti-fogging agents, or stabilizers are commonly used for food packaging films for the purpose of imparting flexibility or other properties to the film and
20 facilitating manufacture of the film.

[0004] In recent years, compatibility of the regulations and standards of the Food Sanitation Law with those of other countries have been contemplated, and the standard for the amount of additives contained in food packaging film that can migrate to food has been an issue.
25 Currently, the most prevalent idea is that the amount of additive migration to foods should meet the assumed reference value of 25 $\mu\text{g/ml}$

of EU regulations and standards.

Citation List

Patent Literature

[0005] [Patent Literature 1] Japanese Unexamined Patent Publication
No. 2015-7198

Summary of Invention

Technical Problem

[0006] It is an object of the present invention to provide a food
wrapping film that can inhibit migration of additives to foods and is
excellent in film-forming properties and productivity, and to provide an
article that is a food wrapping rolled film with a box.

Solution to Problem

[0007] The present invention provides a food wrapping film containing
a thermoplastic resin, a blue colorant, and a polyester plasticizer having
a number average molecular weight of 1000 to 1800.

[0008] The content of the polyester plasticizer is 6.5 to 12.5% by mass
based on the total amount of the film.

[0009] The thermoplastic resin may be at least one selected from the
group consisting of polyvinyl chloride resins, polyvinylidene chloride
resins, polyolefin resins, polystyrene resins, polyester resins and
polyamide resins.

[0010] The film may contain, as the thermoplastic resin, 70% by mass
or more based on the total amount of the film of at least one resin
selected from the group consisting of polyvinyl chloride resins,
polyvinylidene chloride resins and polyolefin resins.

[0011] The present invention also provides an article including the food

wrapping film, a core material on which the food wrapping film is rolled, and a box in which the food wrapping film and the core material are stored, wherein the box is provided with a blade part for cutting the food wrapping film.

5 **Advantageous Effects of Invention**

[0012] According to the present invention, it is possible to provide a food wrapping film that can inhibit migration of additives to foods and is excellent in film-forming properties and productivity, and to provide an article that is a food wrapping rolled film with a box.

10 **Brief Description of Drawings**

[0013] FIG. 1 is a schematic view showing a food wrapping rolled film with a box.

Description of Embodiments

15 [0014] The film according to the present embodiment contains a thermoplastic resin, a blue colorant, and a polyester plasticizer having a number average molecular weight of 1000 to 1800 (hereinafter also referred to as a “predetermined polyester plasticizer”), and is preferably used as a food packaging film.

20 [0015] The thermoplastic resin may be a polyvinyl chloride resin such as polyvinyl chloride; a polyvinylidene chloride resin such as polyvinylidene chloride; a polyolefin resin such as polyethylene, polypropylene or saponified ethylene-vinyl acetate copolymer; a polystyrene resin such as butadiene-styrene copolymer, acrylonitrile-styrene copolymer, polystyrene, styrene-butadiene-styrene copolymer, 25 styrene-isoprene-styrene copolymer or styrene-acrylic acid copolymer; a polyester resin such as polyethylene terephthalate, polyethylene

naphthalate or polybutylene terephthalate; a polyamide resin such as 6-nylon, 6,6-nylon or 12-nylon; or the like. The thermoplastic resin is preferably a polyvinyl chloride resin or a polyvinylidene chloride resin, from the viewpoint of excellent handling property.

5 [0016] As the polyvinyl chloride resin, a polyvinyl chloride resin having an average degree of polymerization of 700 to 1300 is preferable from the viewpoint of excellent moldability, heat resistance and fluidity of the film. The average polymerization degree in the present specification means an average degree of polymerization measured
10 according to JIS K6720-2.

[0017] The polyvinyl chloride resin may be a vinyl chloride homopolymer (polyvinyl chloride resin) from the viewpoint of excellent mechanical properties, or the polyvinyl chloride resin may be a copolymer of a vinyl chloride and other monomer copolymerizable
15 therewith, for the purpose of imparting other properties. The copolymer may be a graft copolymer, a block copolymer or a random copolymer. Examples of the other monomer include olefins such as ethylene, propylene and polybutene; vinyl esters of saturated acids such as vinyl acetate and vinyl laurate; alkyl esters of unsaturated acids such
20 as methyl acrylate and methyl methacrylate; alkyl vinyl ethers such as lauryl vinyl ether; maleic acid, acrylonitrile, styrene, methylstyrene, vinylidene fluoride; and the like. When the polyvinyl chloride resin is a copolymer, the content of the vinyl chloride unit in the copolymer may be 10% by mass or more based on the total amount of monomer units,
25 and is preferably 30% by mass or more and more preferably 50% by mass or more, from the viewpoint of excellent mechanical properties.

The upper limit of the content of the vinyl chloride unit in the copolymer is not particularly limited, and may be, for example, 99% by mass or less based on the total amount of monomer units.

[0018] The polyvinyl chloride resin may be, for example, a polymer blend with a three-dimensional polymer of acrylonitrile-butadiene-styrene or the like, a post-treatment product with an alcohol or the like, or a post-treatment product with a chlorine-containing compound. In these cases, the content of the vinyl chloride unit in the polyvinyl chloride resin may be 10% by mass or more based on the total amount of the resin.

[0019] The polyvinylidene chloride resin may be a vinylidene chloride homopolymer (polyvinylidene chloride resin), for example, may be a copolymer containing vinylidene chloride and other monomer copolymerizable with vinylidene chloride as monomer units. The other monomer may be vinyl chloride, an acrylate ester of acrylic acid and an alcohol having 1 to 8 carbon atoms, a methacrylic acid ester of methacrylic acid and an alcohol having 1 to 8 carbon atoms, a vinyl ester of an aliphatic carboxylic acid, an unsaturated aliphatic carboxylic acid, an olefin, a vinyl ether, or the like. The copolymer of vinylidene chloride and vinyl chloride shall belong to the polyvinylidene chloride resin.

[0020] The content of the vinylidene chloride unit in the polyvinylidene chloride resin may be, for example, 60% by mass or more, 70% by mass or more, or 80% by mass or more, based on the total amount of monomer units, from the viewpoint of moldability and heat resistance of the film. The upper limit of the content of the vinylidene chloride unit

in the polyvinylidene chloride resin is not particularly limited, and may be, for example, 99% by mass or less based on the total amount of monomer units. The content of the vinylidene chloride unit can be measured by a nuclear magnetic resonance (NMR) apparatus.

5 [0021] The weight average molecular weight of the polyvinylidene chloride resin may be, for example, 40,000 to 180,000, 60,000 to 160,000, or 80,000 to 140,000. The weight average molecular weight of the polyvinylidene chloride resin can be measured by GPC method using polystyrene of known molecular weight as a standard substance.

10 [0022] The conditions of the GPC method used for measuring the weight average molecular weight of the polyvinylidene chloride resin are as follows. A gel chromatograph Alliance GPC 2000 model manufactured by Waters Corporation is used as a measuring device. A solution prepared by dissolving a polyvinylidene chloride resin in
15 tetrahydrofuran so as to be 0.5% by weight is used as a sample.

Column: TSKgel GMHHR-H(S) HT 30 cm × 2, TSKgel GMH6-HTL 30 cm × 2 manufactured by Tosoh Corporation

Mobile phase: Tetrahydrofuran

Detector: Differential refractometer

20 Flow rate: 1.0 mL/min

Column temperature: 20°C

Injection amount: 500 μL

[0023] The content of the thermoplastic resin may be 70% by mass or more or 75% by mass or more, and may be 85% by mass or less or 80%
25 by mass or less, based on the total amount of the film, from the viewpoint of excellent productivity. The content of the polyvinyl

chloride resin or the polyvinylidene chloride resin is more preferably within the above range.

[0024] The blue colorant is, for example, a colorant having a maximum absorption wavelength in the visible light region (380 to 750 nm) of 600 to 750 nm. The absorbance at the maximum absorption wavelength in the visible light region of the blue colorant is preferably at least 2 times and more preferably at least 3 times the absorbance at 470 nm.

Specifically, the blue colorant may be copper phthalocyanine (copper phthalocyanine blue), iron(III) hexacyanoferrate(II), cobalt·oxide-aluminum oxide mixture, indigo, ultramarine, or the like.

[0025] The content of the blue colorant may be 0.5% by mass or more, and 2.0% by mass or less, based on the total amount of the film.

[0026] The number average molecular weight of the polyester plasticizer is 1000 to 1800, and is preferably 1200 to 1800, more preferably 1300 to 1800, still more preferably 1400 to 1800, and particularly preferably 1500 to 1800, in view of further inhibiting the migration of the additive to foods. The number average molecular weight in the present invention is the number average molecular weight in terms of polystyrene measured by GPC (e.g., Agilent 1260 Infinity GPC, a model manufactured by Agilent Technologies Japan, Ltd.).

[0027] The conditions of the GPC method used for measuring the weight average molecular weight of the polyester plasticizer are as follows. A gel chromatograph Alliance GPC 2000 model manufactured by Waters Corporation is used as a measuring device. A sample solution is prepared by completely dissolving 30 mg of a sample in 20 mL of o-dichlorobenzene at 145°C to obtain a solution, and then

filtering the obtained solution by a sintered filter having a pore size of 0.45 μm to obtain the sample solution. The other conditions are as follows.

Column: TSKgel GMHHR-H(S) HT 30 cm $\times$ 2, TSKgel

5 GMH6-HTL 30 cm $\times$ 2 manufactured by Tosoh Corporation

Mobile phase: o-dichlorobenzene

Detector: Differential refractometer

Flow rate: 1.0 mL/min

Column temperature: 140°C

10 Injection amount: 500 μL

[0028] An example of a polyester plasticizer includes an aliphatic polybasic acid polyester plasticizer. The aliphatic polybasic acid polyester plasticizer can be, for example, a polyester resin containing an aliphatic polybasic acid such as an adipic acid or a sebacic acid and a
15 polyhydric alcohol such as an ethylene glycol, a propylene glycol, or a butanediol. Specific examples of the aliphatic polybasic acid polyester plasticizer include a poly(ethylene glycol/adipic acid) ester, a poly(1,3-butanediol/adipic acid) ester, a poly(1,4-butanediol/adipic acid) ester, a poly(propylene glycol/sebacic acid) ester, or the like. These polyester
20 plasticizers are used alone or as a combination of two or more thereof.

[0029] The content of the predetermined polyester plasticizer is preferably 6.5% by mass or more, more preferably 7.0% by mass or more, further preferably 8.0% by mass or more, and particularly preferably 10.0% by mass or more, based on the total amount of the
25 film, from the viewpoint of further inhibiting the migration of the additive to foods. The content of the predetermined polyester

plasticizer is preferably 12.5% by mass or less, and more preferably 12.0% by mass or less, based on the total amount of the film, from the viewpoint of more excellent film-forming properties and productivity.

[0030] In addition to the thermoplastic resin, the blue colorant, and the polyester plasticizer, the film may further contain other components.

Examples of other components include a thermal stabilizer, a light stabilizer, a plasticizer other than the predetermined polyester plasticizer, a lubricant, a filler, a plate-out inhibitor, an antioxidant, a release agent, a viscosity lowering agent, a surfactant, a coloring agent other than the blue colorant, a fluorescent agent, a surface treatment agent, a crosslinking agent, a processing aid, a pressure-sensitive adhesive, an antistatic agent, an ultraviolet absorber, an antiblocking agent, and the like.

[0031] The film may consist of a single layer containing the thermoplastic resin, the blue colorant and the predetermined polyester plasticizer, or may consist of a plurality of layers. When the film consists of a plurality of layers, the film may include, for example, a first surface layer, an intermediate layer and a second surface layer in this order. In this case, for example, the first and second surface layer may contain the thermoplastic resin and the predetermined polyester plasticizer, and the intermediate layer may contain the thermoplastic resin and the blue colorant. The film may further includes, for example, an adhesive layer containing an acid-modified polyolefin resin or the like in order to improve the adhesion between layers, and a heat resistant layer containing a polyamide resin may be further provided in order to improve the heat resistance of the film. When the

thermoplastic resin is a polyvinyl chloride resin, the film preferably consists of a single layer containing a thermoplastic resin (polyvinyl chloride resin), the blue colorant and the predetermined polyester plasticizer.

5 [0032] The thickness of the film may be preferably 5 μm or more and more preferably 6 μm or more, from the viewpoint of efficiently shielding the food from the outside air, and may be preferably 25 μm or less and more preferably 12 μm or less, from the viewpoint of excellent handling property.

10 [0033] The amount of migration of the additive contained in the film is preferably 25 $\mu\text{g/ml}$ or less and more preferably 20 $\mu\text{g/ml}$ or less as the amount of migration to heptane and the amount of migration to isooctane measured according to the following procedures.

[0034] (Amount of Migration to Heptane)

15 A sample with a fixed area was cut from the film and immersed in 2 ml of heptane per cm^2 of surface area of the sample at a temperature of 25°C for 1 hour. Next, after removing the sample, the heptane solution was evaporated to dryness, and the amount of migration of the additive from the film to the heptane was determined by measuring the mass of solids.

20 [0035] (Amount of Migration to Isooctane)

A sample with a fixed area was cut from the film and immersed in 2 ml of an isooctane per cm^2 of surface area of the sample at a temperature of 25°C for 30 minutes. Next, after removing the sample, 25 the isooctane solution was evaporated to dryness, and the amount of migration of the additive from the film to the isooctane was determined

by measuring the mass of solids.

[0036] The film is produced by mixing a composition containing the thermoplastic resin, the blue colorant and the predetermined polyester plasticizer with a mixer such as a V-type blender, a ribbon blender, a Henschel mixer or a super mixer, and further kneading the mixture with a mixing roll, a Banbury mixer or a kneading machine such as a kneader, as necessary, to obtain a composition, followed by extrusion molding, for example. Specifically, the composition is supplied to a hopper of an extruder, and a targeted film is obtained by an inflation method, a T-die method, or the like. Generally, the film is wound while the film is being produced, and the wound film is further rewound (rolled) for each desired length such as 20 m or 50 m, packed in a box (decorative box), thereby forming a product. That is, the film in this embodiment may be in the form of a food wrapping rolled film or in the form of a food wrapping rolled film with a box.

[0037] Specifically, as shown in FIG. 1, an article (a food wrapping rolled film) 1 with a box includes a food wrapping film 2, a core material 3 on which the food wrapping film 2 is rolled, and a box 4 in which the food wrapping film 2 and the core material 3 are stored, and the box 4 may be provided with a blade part 5 for cutting the food wrapping film 2. The material of the core material 3 and the box 4 is not particularly limited. From the viewpoint of easily recognizing the color of the film 2 from the outside, at least a part of the box 4 is preferably transparent, or has a hole in such a degree as not to impair the function as a box.

[0038] When the film is composed of a plurality of layers, the film can

be obtained by putting the constituent raw materials of each layer into separate extruders, melt-extruding them, co-extruding each layer by inflation, T-die method or the like and laminating them. In this case, it is preferable to form the film by directly drawing the molten substance extruded from the T-die while rapidly cooling it with a casting roll or the like.

[0039] For the film obtained as above, depending on the purpose such as reduction in thermal shrinkage, natural shrinkage, etc. and suppression of occurrence of width contraction, longitudinal stretching between heating rolls, various heat setting, or heat treatment such as aging may be carried out. For the purpose of imparting and promoting anti-fogging property, antistatic property, tackiness, etc., surface treatment and surface processing such as treatment such as corona treatment and ripening, printing and coating and the like may be carried out.

[0040] The film described above is a film through which a wrapped food is visually recognizable from the outside. Further, the film is a film (stretch film) having stretchability (extendability).

[0041] The film according to the present embodiment may be a sorting film for foods used for sorting foods. When using the film according to the present embodiment, two or more types of foods can be sorted into at least two groups according to the type of food. That is, for example, the first food can be wrapped in the film according to the present embodiment and sorted into the first group, while the second food can be wrapped in a film having a color different from that of the film according to the present embodiment or a colorless film and sorted

into the second group.

[0042] Specifically, for example, when there is a first food containing a first allergic substance and a second food containing a second allergic substance, the first food is sorted into a first group that is a group of foods to be provided to a person having no allergic symptom with the first allergic substance, while the second food is sorted into a second group that is a group of foods to be provided to a person having no allergic symptom with the second allergic substance. In the above example, occurrence of an accident that the first or second allergic substance is provided to a person having an allergic symptom to the allergic substance can be suppressed.

Examples

[0043] Hereinafter, the present invention will be more specifically described based on examples, but the present invention is not limited to the examples.

[0044] After charging the thermoplastic resin, blue colorant and various additives shown in Tables 1 and 2 into a super mixer, the material temperature was raised from normal temperature to 130°C while stirring the mixture. After mixing, the mixture was taken out when cooled down to 70°C to prepare a resin composition. Each resin composition was extruded at a resin temperature of 200°C with a Φ 40 mm single screw extruder ($L/D = 20$) equipped with a T-die (width 350 mm, gap 0.4 mm) to prepare a film having a thickness of 8 μm . The numerical values in the tables are values in terms of solid content and represent % by mass.

[0045] Thermoplastic resin a1: Polyvinyl chloride resin ("TH-1000"

manufactured by TAIYO VINYL CORPORATION, average degree of polymerization: 1000)

Blue colorant b1: Copper phthalocyanine (copper phthalocyanine blue, “NX-053 blue” manufactured by Dainichiseika Color & Chemicals Mfg. Co., Ltd.)

Additive c1: Polyester plasticizer ("PN-150" manufactured by ADEKA Corporation, number average molecular weight: 1000, adipic acid polyester)

Additive c2: Polyester plasticizer ("D623" manufactured by J-PLUS Co., Ltd., number average molecular weight: 1800, adipic acid polyester)

Additive c3: Polyester plasticizer ("D620N" manufactured by J-PLUS Co., Ltd., number average molecular weight: 800, adipic acid polyester)

Additive c4: Polyester plasticizer ("P-200" manufactured by ADEKA Corporation, number average molecular weight: 2000, adipic acid polyester)

Additive c5: Dioctyl adipate ("SANSO CIZER DOA" manufactured by New Japan Chemical Co., Ltd.)

Additive c6: Epoxidized soybean oil ("Chemicizer SE-100" manufactured by Sanwa Synthetic Chemical Industry Co., Ltd.)

Additive c7: Glycerin fatty acid ester ("XO-100" manufactured by RIKEN VITAMIN CO., LTD.)

Additive c8: Ca/Zn Stabilizer ("SC-308E" manufactured by ADEKA Corporation)

[0046] For each of the obtained films, the amount of migration of the

additives was measured as described below.

[0047] (Amount of Migration to Heptane)

A 5 cm by 10 cm sample was cut from the film so that the total surface area of the two sides of the film was 100 cm² and immersed in 2 ml of heptane per cm² of surface area of the sample at a temperature of 25°C for 1 hour. Next, after removing the sample, the test solution was evaporated to dryness at 105°C and allowed to cool. The mass of solids after cooling was measured and the amount of migration of the component from the film to the heptane was calculated using the following formula. In the case of a polyvinyl chloride resin, 150 µg/ml or less is good, and 30 µg/ml or less is very good.

Evaporation Residue (µg/ml) = Weight of Solids (µg)/Collected Amount of Test Solution (ml)

[0048] (Amount of Migration to Isooctane)

A 5 cm by 10 cm sample was cut from the film so that the total surface area of the two sides of the film was 100 cm² and immersed in 2 ml of an isooctane solution per 1 cm² of surface area of the sample at a temperature of 25°C for 30 minutes. Next, after removing the sample, the test solution was evaporated to dryness at 105°C and allowed to cool. The mass of solids after cooling was measured and the amount of migration of the component from the film to the isooctane was calculated using the following formula. In the case of a polyvinyl chloride resin, 90 µg/ml or less is good, and 30 µg/ml or less is very good.

Evaporation Residue (µg/ml) = Weight of Solids (µg)/Collected Amount of Test Solution (ml)

[0049] (Evaluation of Film-Forming Properties)

Each resin composition was extruded at a resin temperature of 200°C with a T-die extruder to mold a film, and the appearance of the obtained film was observed to evaluate film-forming properties.

5 Evaluation criteria are as follows. When it is evaluated as A or B, it can be said that the film is excellent in film-forming properties.

A: A film having a substantially uniform thickness was obtained, and no scorch occurred by extrusion for 24 hours.

10 B: Slight unevenness in the film thickness was observed, and a scorch occurred by extrusion for 24 hours.

C: Unevenness in the film thickness was large, and a scorch occurred by extrusion for 8 hours.

[0050] (Evaluation of Productivity)

15 The number of occurrences of production trouble (perforation, film runout and slit defect) per 24 hours occurring when extruding each resin composition at a resin temperature of 200°C with a T-die extruder to mold a film was counted to evaluate productivity. Evaluation criteria are as follows. When it is evaluated as A or B, it can be said that the film is excellent in productivity.

20 A: The number of production trouble was 0 to 2

B: The number of production trouble was 3 to 4

C: The number of production trouble was 5 or more

[0051] [Table 1]

		Example 1	Example 2	Example 3	Example 4	Example 5
Composition (% by mass)	a1	74.0	74.0	73.0	73.0	75.0
	b1	1.0	1.0	1.0	1.0	1.0
	c1	7.0	-	12.0	-	4.0
	c2	-	7.0	-	12.0	4.0
	c3	-	-	-	-	-
	c4	-	-	-	-	-
	c5	6.0	6.0	3.0	3.0	4.0
	c6	9.0	9.0	8.0	8.0	9.0
	c7	2.0	2.0	2.0	2.0	2.0
	c8	1.0	1.0	1.0	1.0	1.0
Amount of migration to heptane (µg/ml)		22	20	18	17	21
Amount of migration to isooctane (µg/ml)		24	22	20	18	23
Film-forming properties		A	A	A	A	A
Productivity		A	A	A	A	A

[0052] [Table 2]

		Comp. Example 1	Comp. Example 2	Comp. Example 3	Comp. Example 4	Comp. Example 5
Composition (% by mass)	a1	75.0	75.0	75.0	74.0	74.0
	b1	1.0	1.0	1.0	1.0	1.0
	c1	-	-	-	-	-
	c2	-	-	-	-	-
	c3	-	10.0	-	12.5	-
	c4	-	-	10.0	-	12.5
	c5	10.0	-	-	-	-
	c6	11.0	11.0	11.0	9.5	9.5
	c7	2.0	2.0	2.0	2.0	2.0
	c8	1.0	1.0	1.0	1.0	1.0
Amount of migration to heptane (µg/ml)		40	33	19	30	16
Amount of migration to isooctane (µg/ml)		45	38	23	35	19
Film-forming properties		A	B	C	B	C
Productivity		A	B	C	C	C

Reference Signs List

[0053] 1... food wrapping rolled film with a box, 2... food wrapping film, 3... core material, 4... box, 5... blade part.

CLAIMS

1. A food wrapping film comprising:
 - a thermoplastic resin;
 - a blue colorant; and
 - 5 a polyester plasticizer having a number average molecular weight of 1000 to 1800.
2. The food wrapping film according to claim 1, wherein a content of the polyester plasticizer is 6.5 to 12.5% by mass based on a total amount of the film.
- 10 3. The food wrapping film according to claim 1 or 2, wherein the thermoplastic resin is at least one selected from the group consisting of polyvinyl chloride resins, polyvinylidene chloride resins, polyolefin resins, polystyrene resins, polyester resins and polyamide resins.
4. An article comprising:
 - 15 the food wrapping film according to any one of claims 1 to 3;
 - a core material on which the food wrapping film is rolled; and
 - a box in which the food wrapping film and the core material are stored,
 - wherein the box is provided with a blade part for cutting the
 - 20 food wrapping film.