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(54) Titre : COMPOSE DE MOULAGE NON PLASTIFIE, A BASE DE CHLORURE DE POLYVINYLE; PROCEDE DE FABRICATION ET UTILISATION DE CE COMPOSE

(54) Title: UNPLASTICIZED POLYVINYL-CHLORIDE-BASED MOULDING COMPOUND, PROCESS FOR ITS PRODUCTION AND USE

(57) Abrégé/Abstract:
The invention relates to an unplasticized moulding compound based on polyvinyl chloride including vinyl chloride co- and/or terpolymer and/or blends or alloys thereof with a vinyl chloride or PVC content of more than 70% w/w, preferably more than 85% w/w, and 15% to 0% w/w of at least one impact-modifying polymer, where in addition to any pigments, dyes, lubricants, blowing agents, flame retardants, fillers, reinforcing fibres and other processing aids and additives, the unplasticized moulding compound contains or is comprised of: a. 0.01 to 3 parts by weight of at least one calcium carboxylate; b. 0.01 to 3 parts by weight of at least one zinc carboxylate; c. 0.01 to 3 parts by weight of at least one organic co-stabilizer, selected from the group of at least one β-diketone, organic phosphate and/or dihydropyridine; and d. 0.01 to 5 parts by weight of at least one surface-modifying alkaline earth oxide, one alkaline earth hydroxide and/or one partially hydrated alkaline earth oxide per 100 parts by weight of said PVC mixture or said vinyl chloride copolymer. The invention further relates to the use of said moulding compound and the process for its production.

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Summary

The invention relates to an unplasticized moulding compound based on polyvinyl chloride including vinyl chloride co- and/or terpolymer and/or blends or alloys thereof with a vinyl chloride or PVC content of more than 70% w/w, preferably more than 85% w/w, and 15% to 0% w/w of at least one impact-modifying polymer, where in addition to any pigments, dyes, lubricants, blowing agents, flame retardants, fillers, reinforcing fibres and other processing aids and additives, the unplasticized moulding compound contains or is comprised of:

a. 0.01 to 3 parts by weight of at least one calcium carboxylate;

b. 0.01 to 3 parts by weight of at least one zinc carboxylate;

c. 0.01 to 3 parts by weight of at least one organic co-stabilizer, selected from the group of at least one ß-diketone, organic phosphite and/or dihydropyridine; and

d. 0.01 to 5 parts by weight of at least one surface-modifying alkaline earth oxide, one alkaline earth hydroxide and/or one partially hydrated alkaline earth oxide

per 100 parts by weight of said PVC mixture or said vinyl chloride copolymer.

The invention further relates to the use of said moulding compound and the process for its production.

UNPLASTICIZED POLYVINYL-CHLORIDE-BASED MOULDING COMPOUND, PROCESS FOR ITS PRODUCTION AND USE

The present invention relates to an unplasticized polyvinyl-chloride-based moulding compound containing more than 70% w/w per 100 parts by weight plastic material, preferably more than 85% w/w (related to the plastic material) of vinyl chloride homo-, co- and/or terpolymer and/or blends or alloys of vinyl chloride homo-, co- and/or terpolymer with a vinyl chloride or PVC content of more than 70% w/w, preferably more than 85% w/w, and 15% to 0% w/w of at least one impact-modifying polymer, or the equivalent monomer content in the case of copolymers, selected from the group of alkyl acrylates, chlorinated polyethylenes, ethylene vinyl acetate copolymer or ehtylene vinyl acetate carbon monoxide terpolymer and other additives, processing aids and the like. The polyvinyl-chloride-based plastic moulding compound of the invention contains specified parts by weight of at least one co-stabilizer, surface-treated alkaline earth oxide and/or partially hydrated alkaline earth oxide and other additives.

The invention further relates to a process for the production of said moulding compound and its use in an extrusion process.

EP-B-0 001 859 has already provided a rigid and heat-stabilized, vinyl-chloride-polymer-based composition containing magnesium oxide and a saturated polyhydric alipathic alcohol as heat stabilizers as well calcium and zinc stearate and other processing aids and addititives. Such heat-stabilized compositions are particularly suitable for the manufacture of pipes and profiles, offering a benefit in that they do not contain lead or cadmium. However, their thermal stability and processing characteristics are worthy of improvement.

The aim and object of the present invention was to find a moulding compound with improved properties and/or improved processing characteristics and/or to improve the properties of the mouldings produced from such moulding compound. In particular, improved thermal stability of the moulding compound during processing was to be achieved. In addition, stabilizers containing lead and cadmium were to be avoided. The risk of corrosion occuring during processing in the extruder was to be reduced.

According to the invention it was found that such requirements were satisfied by an unplasticized, polyvinyl-cloride-based moulding compound which contains, per 100 parts by weight plastic material, more than 70% w/w, preferably more than 85% w/w of vinyl chloride homo-, co-, and/or terpolymers and/or blends and alloys of vinyl chloride homo-, co- and/or terpolymers with a vinyl chloride or PVC content of more than 70% w/w, preferably more than 85% w/w, and 15% to 0% w/w of at least one impact-modifying polymer (or the equivalent monomer content in the case of copolymers), selected from the group of alkyl acrylates, chlorinated polyethylenes, ehtylene vinyl acetate copolymers or ethylene vinyl acetate carbon monoxide terpolymers.

In addition to any pigments, dyes, lubricants, blowing agents, flame retardants, fillers, reinforcing fibres or other processing aids and additives, the unplasticized moulding compound of the invention contains or is comprised of:

a. 0.01 to 3 parts by weight of at least one calcium carboxylate;

b. 0.01 to 3 parts by weight of at least one zinc carboxylate;

c. 0.01 to 3 parts by weight of at least one organic co-stabilizer, selected from the group of at least one ß-diketone, organic phosphite and/or dihydropyridine; and

d. 0.01 to 5 parts by weight of at least one alkaline earth oxide, one alkaline earth hydroxide and/or one partially hydrated alkaline earth oxide, preferably calcium oxide and/or magnesium oxide, and/or partially hydrated calcium oxide and/or partially hydrated magnesium oxide and/or calcined dolomite or partially hydrated calcined dolomite, with the surface of said alkaline earth oxide, alkaline earth hydroxide and/or partially hydrated alkaline earth oxide, preferably the calcium oxide and/or the magnesium oxide and/or the partially hydrated calcium oxide and/or the partially hydrated magnesium oxide and/or the calcined dolomite or the partially hydrated calcined dolomite being entirely or partly coated with a surface-modifying treating agent or coating agent,

per 100 parts by weight of said PVC blend of the vinyl chloride copolymer.

Salts of calcium and/or zinc with fatty acids and/or their derivatives, preferably C_8 to C_{32} fatty acids additionally containing polar groups, are used as calcium and/or zinc carboxylates. C_{15} to C_{21} fatty acids their derivatives and/or blends, and in particular fatty acids containing additional polar groups, are preferably used. Especially suited are stearates, hydroxy stearates, palmitates and/or behenates, or fatty acids or fatty acid derivatives of these compounds which contain additional polar groups, preferably hydroxyl groups.

In a preferred embodiment said moulding compound additionally contains

e. 0.01 to 15 parts by weight of at least one filler, preferably at least one inorganic filler.

In another preferred embodiment said moulding compound additionally contains or is comprised of:

f. 0.01 to 5 parts by weight of at least one external lubricant and/or internal lubricant; and/or

g. 0.01 to 5 parts by weight of a processing aid or an additive, preferably selected from the group of the polymeric alkyl methacrylates

per 100 parts by weight of said PVC compound or vinyl chloride copolymer.

In a preferred embodiment of the invention said moulding compound additionally contains or comprises:

a. 0.05 to 1.5 parts by weight of at least one calcium carboxylate;

b. 0.05 to 1.5 parts by weight of at least one zinc carboxylate;

c. 0.05 to 2 parts by weight of at least one organic co-stabilizer selected from the group of at least one ß-diketone, organic phosphite and/or dihydropyridine;

d. 0.05 to 1 parts by weight of calcium oxide and/or magnesium oxide;

e. 0.05 to 10 parts by weight of at least one filler, preferably an inorganic filler;

f. 0.5 to 5 parts by weight of at least one pigment and/or dye, lubricant and/or internal lubricant;

g. 0.5 to 3.5 parts by weight of a processing aid or additive selected from the group of polymeric alkyl methacrylates, preferably polymethyl methacrylate

per 100 parts by weight of the plastic material or plastic blend.

According to this invention, a benzoyl stearoyl methane is preferably used as the ß-diketone.

The preferred phosphites added to said moulding compound are triphenyl phosphite, trilauryl phosphite, diphenyl decyl phosphite, tridexyl phosphite and/or phenyl didecyl phosphite.

In a preferred embodiment of the invention said co-stabilizer, selected from the group of at least one ß-diketone, organic phosphite and/or dihydropyridine, is replaced by a polyol up to a weight content of 70% (based on 100% w/w of the co-stabilizer used) and preferably up to 50%. If possible, the weight content of said polyol should be below 50% and especially preferably below 40% (based on 100% w/w of the co-stabilizer used) to ensure improved thermal stabilization of the moulding compound.

The preferred polyols used are trimethylol propane, di-trimethylol propane, pentaerythritol and blends of these polyols among themselves or with other polyols. In another embodiment the polyol, used to a certain extent as co-stabilizer, is replaced by a polyether polyol.

In another preferred embodiment said moulding compound additionally contains or comprises, in addition to the additives heretofore mentioned:

h. 0.01 to 10 parts by weight, preferably
0.5 to 5 parts by weight,

of a pigment and/or dye; and/or

i. 0.05 to 4 parts by weight, preferably
0.1 to 2 parts by weight,

of at least one blowing agent; and/or

j. 0.5 to 10 parts by weight, preferably
1 to 8 parts by weight,

of at least one flame retardant,

per 100 parts by weight of said PVC compound or vinyl chloride copolymer.

Organic-chemical and/or inorganic-chemical blowing agents are used as blowing agents, preferably those which separate nitrogen or carbon dioxide under heat. Blowing agents pertaining to the group of azodicarbonamides and/or sodium bicarbonates are preferably used.

The flame retardants commonly employed as flame retardants for plastic materials, preferably aluminium hydroxide and/or antimony trioxide, are used as flame retardants.

As mentioned before, the surface of said calcium oxide, magnesium oxide, partially hydrated calcium oxide, partially hydrated magnesium oxide, said calcined dolomite and/or partially hydrated calcined dolomite is, according to the invention, entirely or partly coated with a surface-modifying treating agent or coating agent, and said surface-modifying treating agent or coating agent

is a saturated or unsaturated fatty acid or its esters, salts or derivatives.

In a preferred embodiment of the invention both the surface of said filler or filler blend or a portion of said filler or filler blend and the surface of said calcium oxide and/or said magnesium oxide are entirely or partly coated with a surface-modyfying treating agent or coating agent, and said surface-modifying treating agent or coating agent is a saturated or unsaturated fatty acid or its esters, salts or derivatives.

Said surface treating agents or coating agents are applied in the form of a solution, dispersion, melt or the like. In a preferred embodiment said surface treating or coating agent is applied to said alkaline earth oxide or partially hydrated alkaline earth oxide, preferably to the calcium oxide, magnesium oxide, partially hydrated calcium oxide, partially hydrated magnesium oxide, to the calcined dolomite or the partially hydrated calcined dolomite in the hot state or in the form of a melt. This is preferably performed in a high-temperature mixer or a combined high-temperature/cooling mixer.

Said surface treating agent is preferably applied to the filler in the form a dispersion or solution of the surface treating agent or coating agent.

In a preferred embodiment of the invention said calcium oxide, magnesium oxide, partially hydrated calcium oxide, partially hydrated magnesium oxide, said calcined dolomite and/or said partially hydrated calcined dolomite is surface-modified with a saturated or unsaturated fatty acid which contains at least one OH group or at least another polar group in addition to the COOH, ester and/or COO group.

In another preferred embodiment said calcium and/or magnesium oxide and/or said filler or filler blend or a portion of said filler or filler blend, which preferably contains or is comprised of fine-particle calcium carbonate, is surface-modified with at least one saturated or unsaturated fatty acid, its esters, salts or derivatives which contain at least one OH group or at least another polar group in addition to the COOH, ester and/or COO group.

As polar groups-containing organic carboxylic acids saturated and/or unsaturated monocarboxylic acids or polycarboxylic acids, their derivatives, substituted compounds and/or salts are used, but preferably those which contain one or several hydroxyl group(s), amino group(s), carbonyl group(s) and/or ester group(s) and represent salts of the monocarboxylic acids, preferably fatty acids, or such acids themselves.

Preferred use is made of those C_8-C_{32} and preferably C_{10}-C_{22} fatty acids having additional polar groups which are completely comprised of saturated fatty acids having at least one additional polar group, or which contain an unsaturated fatty acid up to a weight content of 20%, preferably up to 6% w/w, with at least one additional polar group. The fatty acids having polar groups, preferably fatty acids having hydroxyl groups or amino groups, preferably hydroxy stearic acid, hydroxy palmitic acid, hydroxy oleic acid, aminostearic acid, amino linoleic acid and/or the alkali salts of this compound, are preferably employed for the surface treatment of the fillers and/or the magnesium and/or calcium oxide.

In a preferred embodiment a synthetic surface-coated calcium carbonate is used as filler, preferably produced by introducing carbon dioxide into a calcium hydroxide suspension and by a subsequent surface treatment of the produced calcium carbonate with an alkali or ammonium salt of a saturated or unsaturated fatty acid containing at least one polar group, in addition to a carboxylic acid, fatty acid or substituted fatty acid having at least one polar group, preferably with an alkali or ammonium salt of an aliphatic monocarboxylic acid or fatty acid containing at least one hydroxyl, carbonyl, amino and/or ester group. During surface treatment the related calcium compound of this polar groups-containing fatty acid is entirely or partly formed on the surface of the calcium carbonate.

The surface layer formed on the surface of the synthetic calcium cabonate after said treating agent has been applied is preferably comprised of or contains a calcium salt and/or an alkali salt and, where appropriate, an ammonium salt of at least one C_{10}-C_{22} fatty acid having at least one hydroxyl group.

In another embodiment a mono- or polyunsaturated, preferably a di-unsaturated, conjugated or unconjugated carboxylic acid, preferably an alkali salt thereof or an ammonium salt of a mono- or di-unsaturated carboxylic acid, or a mixture thereof, especially crotonic acid, 2-pentene acid, 4-pentene acid, 2-hexene acid, 3-hexene acid, 2,4-pentadienoic acid, 3-butenoic acid and/or 3-methyl crotonic acid, but preferably sorbic acid, is used as an unsaturated carboxylic acid and surface treating agent for the fillers and/or for the calcium oxide and/or magnesium oxide (or partially hydrated compounds thereof).

In a preferred embodiment said mono- or polyunsaturated carboxylic acid or carboxylic acids or a mixture thereof is replaced up to a weight content of 60% (based on 100 parts by weight of the carboxylic acids used for the surface treatment) and preferably to up to 40% w/w, by a saturated and/or unsaturated C_2 - C_{32} monocarboxylic acid having polar groups in addition to the carboxylic groups, and/or by humic acid.

In a preferred embodiment of the invention the alkyl acrylate, preferably butyl acrylate, used as a modifier is replaced by polymethyl methacrylate (PMMA) up to a weight content of 60% (based on 100 parts by weight of the modifier used) and preferably up to 35% w/w.

The vinyl chloride homo-, co- and/or terpolymer contained in the moulding compound has a K-value of preferably 58 to 73. K-values of 64 to 71 are used with special preference.

The invention further relates to a process for the production of a polyvinyl-chloride-based unplasticized moulding compound containing, per 100 parts by weight of plastic material, more than 70% w/w, preferably more than 85% w/w vinyl chloride homo-, co- and/or terpolymer and/or blends or alloys of vinyl chloride homo-, co- and/or terpolymers with a vinyl chloride or PVC content of more than 70% w/w, preferably more than 85% w/w and 15% to 0% w/w of at least one impact-modifying polymer (or the equivalent monomer content in the case of copolymers), selected from the group of alkyl acrylates, chlorinated polyethylenes, ethylene vinyl acetate copolymer or ethylene vinyl acetate carbon monoxide terpolymer, wherein, per 100 parts by weight of said PVC compound or vinyl chloride copolymer, in addition to eventually besides pigments, dyes, lubricants, blowing agents, flame retardants, fillers, reinforcing fibres and other processing aids and additives, the following are mixed together:

a. 0.01 to 3 parts by weight of at least one calcium carboxylate;

b. 0.01 to 3 parts by weight of at least one zinc carboxylate;

c. 0.01 to 3 parts by weight of at least one organic co-stabilizer selected from the group of at least one ß-diketone, organic phosphite and/or dihydropyridine;

d. 0.01 to 5 parts by weight of at least one alkaline earth oxide, one alkaline earth hydroxide and/or one partially hydrated alkaline earth oxide, preferably calcium oxide and/or magnesium oxide, and/or partially hydrated calcium oxide and/or partially hydrated magnesium oxide and/or calcined dolomite or partially hydrated calcined dolomite, with the surface of the calcium oxide entirely or partly coated with a surface-modifying treating agent or coating agent; and

e. 0.01 to 15 parts by weight of at least one filler, preferably at least one inorganic filler, with the surface of at least a portion of a filler entirely or partly coated by a surface-modifying treating agent or coating agent.

According to the process of the invention the plastic materials and the additives are mixed at temperatures of 35°C in a high-temperature mixer, and are heated, as the temperature is increased, to temperatures between 100°C and 125°C (calculated as the melt temperature), preferably between 110°C and 120°C. The moulding compound is then cooled in a cooling mixer to temperatures below 40°C, preferably below 35°C.

In a preferred embodiment the plastic material or the blend of plastic materials and the additives which are solid at ambient temperature (with the exception of the titanium dioxide) are premixed in a high-temperature mixer at 35°C to 50°C, preferably 37°C to 45°C, and the liquid additives are added after a temperature increase when a temperature between 55°C and 65°C, preferably between 57°C and 62°C has been reached, and are then further mixed while the temperature is increased to between 100°C and 125°C (calculated as the melt temperature), perferably between 110°C and 120°C. Subsequently, the moulding compound is cooled in a cooling mixer to temperatures below 40°C, preferably below 35°C.

Where titanium dioxide is used as a pigment, titanium dioxide is added to the premixed plastic/additive blend in the high-temperature mixer within a temperature range from 90°C to 125°C (calculated as the melt temperature), preferably from 110°C to 120°C, and the moulding compound is subsequently cooled in a cooling mixer to temperatures below 40°C, preferably below 35°C.

In a preferred embodiement of the invention said alkaline earth oxide or partially hydrated alkaline earth oxide, preferably calcium oxide and/or magnesium oxide, partially hydrated calcium oxide and/or partially hydrated magnesium oxide and/or the calcined dolomite or partially hydrated calcined dolomite, has a mean particle size below 25 µm, preferably below 5 µm. Mean average particle sizes between 0.5 to 4 µm are used with special preference.

In a preferred embodiment the weight content of said modifying agent or coating agent used for surface treatment, depending on the particle size of said alkaline earth oxide or partially hydrated alkaline earth oxides, preferably of the calcium oxide, magnesium oxide and/or partially hydrated calcium oxide and/or magnesium oxide, is 0.2 to 4.5% w/w, preferably 0.5 to 2.5% w/w, based on 100 parts by weight alkaline earth oxide or partially hydrated alkaline earth oxide.

In a preferred embodiment said filler or filler blend has a mean particle size below 10 µm, preferably below 1 µm. In a preferred embodiment the mean particle size of the alkaline earth oxide or partially hydrated alkaline earth oxide used is at least twice the mean particle size of said filler or filler blend.

The present invention further relates to the use of a polyvinyl-chloride-based unplasticized moulding compound containing, per 100 parts by weight plastic material, more than 70% w/w and preferably more than 85% w/w of vinyl chloride homo-, co- and/or terpolymer and/or blends or alloys of vinyl chloride homo-, co- and/or terpolymer with a vinyl chloride or PVC content of more than 70% w/w, preferably more than 85% w/w, and 15% to 0% w/w of at least one impact-modifying polymer (or the equivalent monomer content in the case of copolymers), selected from the group of alkyl acrylates, chlorinated polyethylenes, ethylene vinyl acetate copolymer or ethylene vinyl acetate carbon monoxide terpolymer, where the moulding compound contains, in addition to eventually besides pigments, dyes, lubricants, blowing agents, flame retardants, reinforcing fibres or other processing aids and additives, the following additives, based on 100 parts by weight of said PVC blend or vinyl chloride polymer:

a. 0.01 to 3 parts by weight of at least one calcium carboxylate;

b. 0.01 to 3 parts by weight of at least one zinc carboxylate;

c. 0.01 to 3 parts by weight of at least one organic co-stabilizer selected from the group of at least one ß-diketone, organic phospite and/or dihydropyridine;

e. 0.01 to 15 parts by weight of at least one filler, preferably an inorganic filler, with the surface of said filler or filler blend and/or the calcium oxide and/or magnesium oxide entirely or partly coated with a surface-modifying treating agent or coating agent having polar groups;

d. 0.01 to 5 parts by weight of at least one alkaline earth oxide, one alkaline earth hydroxide and/or one partially hydrated alkaline earth oxide, preferably calcium oxide and/or magnesium oxide, and/or partially hydrated calcium oxide and/or partially hydrated magnesium oxide and/or calcined dolomite or partially hydrated calcined dolomite, with the surface of the calcium oxide entirely or partly coated with a surface-modifying treating agent or coating agent,

in an extrusion processes or injection moulding for the manufacture of profiles or articles or hollow items, preferably extruded window profiles or extruded pipes.

The mouldings and profiles made from the unplasticized moulding compounds of the invention provide a very good surface finish (a consistently smooth surface). The processing characteristics and properties of the finished parts or profiles including their subsequent treatment (such as cutting, welding, drilling, sawing, bending and the like) are comparable to or better than those of mouldings or profiles manufactured using barium-, cadmium- or lead-containing compounds.

Example 1

	Group	Parts by Weight
Suspension vinyl chloride homopolymer (K-value 68)		100
Polymethyl methacrylate (PMMA)	g	1
Talcum (micronized)	e	10
Benzoyl stearoyl methane	c	0.1
1,4-dihydropyridine	c	0.2
Diphenyldecyl phosphite	c	0.7
Calcium stearate	a	0.8
Zinc octoate	b	0.4
Calcium oxide coated with 2% w/w hydroxy stearic acid (based on 100 parts by weight CaO)	d	0.1
Magnesium oxide coated with 2% w/w hydroxy palmitic acid (based on 100 parts by weight MgO)	d	0.15
Mixture of internal and external lubricants incorporating Montan waxes	f	0.75
Hard paraffin	f	0.2
Partially oxidized hard paraffin	f	0.1

Example 2

	Group	Parts by Weight
Suspension vinyl chloride homopolymer (K-value 68) incl. 8 parts by weight of modifying agent, consisting of butyl acrylate and polymethyl methacrylate		100
Polymethyl methacrylate (PMMA)	g	1
natural calcium carbonate (ground chalk) surface-modified with stearic acid	e	10
Titanium dioxide	h	4
Benzoyl stearoyl methane	c	0.1
1,4-dihydropyridine	c	0.1
Trilauryl phosphite	c	0.5
Blend of trimethylol propane Di-trimethylol propane and pentaerythritol	c	0.5
Calcium behenate	a	0.4
Zinc octoate	b	0.2
Magnesium oxide coated with 2% w/w hydroxy stearic acid (based on 100 parts by weight MgO)	d	0.25
Mixture of internal and external lubricants incorporating Montan waxes	f	0.75
Hard paraffin	f	0.1
Partly oxidized hard paraffin	f	0.1

Example 3

	Group	Parts by Weight
Vinyl chloride graft copolymer with 6% w/w butyl acrylate		100
Polymethyl methacrylate (PMMA)	g	1
Synthetic calcium carbonate (CCP) coated with 2% w/w Hydroxy stearic acid (based on 100 parts by weight $CaCO_3$)	e	5
Titanium dioxide	h	4
Benzoyl stearoyl methane	c	0.1
1,4-dihydropyridine	c	0.1
Phenyldidecyl phosphite	c	0.6
Di-trimethylol propane	c	0.7
Calcium stearate	a	0.8
Zinc stearate	b	0.8
Calcium oxide coated with 2% w/w Hydroxy stearic acid (based on 100 parts by weight CaO)	d	0.15
Mixture of internal and external lubricants incorporating Montan waxes	f	0.75
Hard paraffin	f	0.2
Partially oxidized hard paraffin	f	0.1

Example 4

	Group	Parts by Weight
80 parts by weight suspension vinyl chloride homopolymer (K-value 64) and 20 parts by weight vinyl chloride ethylene vinyl acetate graft copolymer (containing 10% w/w of EVA)		100
Polymethyl methacrylate (PMMA)	g	8
Precipitated calcium carbonate with a particle size < 0.1 µm	e	4
Titanium dioxide	h	2
Benzoyl stearoyl methane	c	0.1
1,4-dihydropyridine	c	0.1
Diphenyldecyl phosphite	c	0.7
Calcium stearate	a	1.2
Zinc stearate	b	1.2
Calcined dolomite (micronized) with a particle size < 1 µm coated with 2% w/w hydroxy stearic acid (based on 100 parts by weight calcined dolomite)	d	0.25
Mixture of internal and external lubricants incorporating Montan waxes	f	0.75
Hard paraffin	f	0.2
Partially oxidized hard paraffin	f	0.1
Fine-particle sodium bicarbonate	i	1

Azodicarbonamide	i	0.35
Antimony trioxide	j	4
Aluminium hydroxide	j	3

Groups:

a = Calcium carboxylate
b = Zinc carboxylate
c = Co-stabilizers
d = Alkaline earth oxide
e = Filler
f = Lubricant
g = Processing aid
h = Pigments
i = Blowing agents
j = Flame retardants

WHAT IS CLAIMED IS:

1. An unplasticized polyvinyl-chloride-based moulding compound containing, per 100 parts by weight plastic material, more than 70% by weight of vinyl chloride homopolymer, copolymer and/or terpolymer and/or blends of alloys of vinyl chloride homopolymer, copolymer, and/or terpolymers with a vinyl chloride or PVC content of more than 70% by weight and 0% to 15% by weight of at least one impact-modifiying polymer, selected from the group consisting of alkyl acrylates, chlorinated polyethylenes, ethylene vinyl acetate copolymer or ethylene vinylacetate carbon monoxide terpolymer, and per 100 parts by weight of said PVC compound or vinyl chloride copolymer:

a. 0.01 to 3 parts by weight of at least one calcium carboxylate;

b. 0.01 to 3 parts by weight of at least one zinc carboxylate;

c. 0.01 to 3 parts by weight of at least one organic co-stabilizer, selected from the group consisting of at least one β-diketone, organic phosphite and/or dihydropyridines; and

d. 0.01 to 5 parts by weight of at least one alkaline earth oxide, one alkaline earth hydroxide and/or one partially hydrated alkaline earth oxide with the surface of said alkaline earth oxide, alkaline earth hydroxide and/or the partially hydrated alkaline earth oxide being coated on the entire surface or in partial regions of the surface with a surface-modifiying treating agent or coating agent.

2. An unplasticized moulding compound according to claim 1, characterized in that it contains more than 85% by weight per 100 parts by weight plastic material of vinyl chloride homopolymer, copolymer and/or terpolymer and/or blends or alloys of vinyl chloride homopolymer, copolymer and/or terpolymer.

3. An unplasticized moulding compound according to claims 1 or 2, characterized in that the PVC content is more than 85% by weight relative to the plastic material.

4. An unplasticized moulding compound according to anyone of claims 1 to 3, characterized in that it further comprises pigments, dyes, lubricants, blowing agents, flame retardants, fillers, reinforcing fibres or other processing aids and additives.

5. An unplasticized moulding compound according to anyone of claims 1 to 4, characterized in that additive (d) comprises at least one coated or partially coated ingredient selected from the group consisting of calcium oxide, magnesium oxide, partially hydrated calcium oxide, partially hydrated magnesium oxide, calcinated dolomite and partially hydrated calcinated dolomite.

6. An unplasticized moulding compound according to claim 1, characterized in that said moulding compound additionally contains.

e) 0.01 to 15 parts by weight of at least one filler.

7. An unplasticized moulding compound according to claim 6, characterized in that additive (e) comprises at least one inorganic filler.

8. An unplasticized moulding compound according to any one of claims 1 to 7, characterized in that per 100 parts by weight of the PVC compound or vinyl chloride copolymer said moulding compound additionally contains or is comprised of:

f. 0.01 to 5 parts by weight of at least one external lubricant and/or internal lubricant; and/or

g. 0.01 to 5 parts by weight of a processing aid or additive.

9. An unplasticized moulding compound according to claim 8, characterized in that additive (g) is selected from the group of polymer alkyl metacrylate.

10. An unplasticized moulding compound according to any one of claims 1 to 9, characterized in that said moulding compound additionally is comprised of:

a. 0.05 to 1.5 parts by weight of at least one calcium carboxylate;

b. 0.05 to 1,5 parts by weight of at least one zinc carboxylate;

c. 0.05 to 2 parts by weight of at least one co-stabilizer, selected from the group consisting of at least one β-diketone, organic phosphite and/or dihydropyridine;

d. 0.05 to 1,5 parts by weight of at least one alkaline earth oxide one alkaline earth hydroxide and/or one partially hydrated alkaline earth oxide, with the

surface of said alkyline earth oxide, alkaline earth hydroxide and/or partially hydrated alkaline earth oxide, entirely or partly coated with a surface-modifying treating agent or coating agent;

e. up to 15 parts by weight of at least one filler;

f. 0.05 to 2 parts by weight of at least one external lubricant and/or internal lubricant; and

g. 0.5 to 3,5 parts by weight of a processing aid or additive, selected from the group of the polymer alkyl methacrylates.

11. An unplasticized moulding compound according to claim 10, characterized in that additive (d) comprises at least one coated or partly coated ingredient selected from the group consisting of calcium oxide, magnesium oxide, partially hydrated calcium oxide, partially hydrated magnesium oxide, calcinated dolomite and partially hydrated calcinated dolomite.

12. An unplasticized moulding compound according to claims 10 or 11, characterized in that additive (e) comprises at least one inorganic filler.

13. An unplasticized moulding compound according to anyone of claims 10 to 12, characterized in that additive (g) comprises a polymethyl methacrylate.

14. An unplasticized moulding compound according to any one of claims 1 to 13, characterized in that said additive (c) includes up to 70% by weight of a polyol based on 100% by weight of the additive used in (c).

15. An unplasticized moulding compound according to claim 14, characterized in that said additive (c) includes up to 50% by weight of a polyol based on 100% by weight of the additive used in (c).

16. An unplasticized moulding compound according to any one of claims 1 to 15, characterized in that per 100 parts by weight of the PVC compound or the vinyl chloride copolymer, said moulding compound additionally contains:

h) 0.01 to 10 parts by weight of a pigment and/or dye; and/or

i) 0.05 to 4 parts by weight of at least one blowing agent; and/or

j) 0.5 to 10 parts by weight of at least one flame retardant.

17. An unplasticized moulding compound according to claim 16, characterized in that additive (h) is present in an amount ranging from 0,5 to 5 parts by weight per 100 parts by weight of the PVC compound or the vinyl chloride copolymer.

18. An unplasticized moulding compound according to claim 16 or 17, characterized in that additive (i) is present in an amount ranging from 0.1 to 2 parts by weight per 100 parts by weight of the PVC compound or the vinyl chloride copolymer.

19. An unplasticized moulding compound according to anyone of claims 16 to 18, characterized in that additive (j) is present in an amount of 1.8 parts by weight per 100 parts

by weight of the PVC compound or the vinyl chloride copolymer.

20. An unplasticized moulding compound according to any one of claims 1 to 19, characterized in that the surface of the calcium oxide, magnesium oxide, partially hydrated calcium oxide, partially hydrated magnesium oxide, the calcined dolomite and/or the partially hydrated calcined dolomite is entirely or partly coated with a surface-modifying treating agent or coating agent, and that said surface modifying agent or coating agent is a saturated or unsaturated fatty acid of its esters, salts or derivatives.

21. An unplasticized moulding compound according to any one of claims 1 to 20, characterized in that the calcium oxide, magnesium oxide, partially hydrated calcium oxide, partially hydrated magnesium oxid, the calcined dolomite and/or the partially hydrated calcined dolomite is surface-modified by a saturated or unsaturated fatty acid, which has at least one OH group or at least one further polar group in addition to the COOH, ester and/or COO group.

22. An unplasticized moulding compound according to any one of claims 1 to 21, characterized in that the impact modifying polymer includes up to 60% by weight of polymethyl methacrylate (PMMA) based on 100 parts by weight of impact modifiying polymer.

23. An unplasticized moulding compound according to of claim 22, characterized in that the polymethyl methacrylate is present in an amount of up to 35% by weight based on 100 parts by weight of the impact modifying polymer.

24. An unplasticized moulding compound according to claim 22 or 23, characterized in that the impact modifying polymer is selected from the group consisting of alkyl acrylate and butyl acrylate.

25. An unplasticized moulding compound according to claim 22, 23 or 24 characterized in that the impact modifying polymer is butyl acrylate.

26. An unplasticized moulding compound according to any one of claims 1 to 24, characterized in that the vinyl chloride homopolymer, copolymer and/or terpolymer contained in the moulding compound has a mean K-value of 58 to 73.

27. An unplasticized moulding compound according to claim 26, characterized in that the vinyl chloride homopolymer, copolymer and/or terpolymer contained in the moulding compound has a mean K-value of 64 to 71.

28. A process for the production of a polyvinyl-chloride-based unplasticized moulding compound containing, per 100 parts by weight of plastic material, more than 70% by weight of a vinyl chloride homopolymer, copolymer and/or terpolymer and/or compounds or alloys of vinyl chloride homopolymer copolymer and/or terpolymer with a vinyl chloride or PVC content of more than 70% by weight relative to the plastics material and 0% to 15% by weight of at least one impact-modifiying polymer, selected from the group consisting of alkyl acrylates, chlorinated polyethylene, ethylene-vinyl acetate co- or ethylene vinyl acetate carbon monoxide terpolymer, and per 100 parts by weight of said PVC compound or vinyl chloride copolymer,

the following is mixed together, in addition to any pigments, dyes, lubricants, blowing agents, flame retardants, fillers, reinforcing fibres and other processing aids and additives:

a. 0.01 to 3 parts by weight of at least one calcium carboxylate;

b. 0.01 to 3 parts by weight of at least one zinc carboxylate;

c. 0.01 to 3 parts by weight of at least one organic co-stabilizer, selected from the group consisting of at least one β-diketone, organic phosphite and/or dihydropyridine;

d. 0.01 to 5 parts by weight of at least one alkaline earth oxide, one alkaline earth hydroxide and/or a partially hydrated alkaline earth oxide, with the surface of said alkaline earth oxide, alkaline earth hydroxide and/or partially hydrated alkaline earth oxide, coated on the entire surface on in partial regions of the surface with a surface-modifying treating agent or coating agent; and

e. 0.01 to 15 parts by weight of at least one filler, of which at least a portion of a filler is coated entirely or partially with a surface-modifiying treating agent or coating agent,

characterized in that the plastic material(s) and the other additives are mixed in a high-temperature mixer at temperatures above 35°C and are heated, as the temperature is increased, to temperatures between 100°C and 125°C (calculated as the melt temperature), and that the moulding compound is then cooled in a cooling mixer to temperatures below 40°C.

29. A process according to claim 28, characterized in that the vinyl chloride homopolymer, copolymer and/or terpolymer and/or compounds or alloys of vinyl chloride homopolymer, copolymer and/or terpolymer is present in an amount of more than 85% by weight per 100 parts by weight of plastic material.

30. A process according to claim 28 or 29, characterized in that the unplasticized moulding compound contains per 100 parts by weight of plastic material more than 85% by weight of a PVC component.

31. A process according to anyone of claims 28 to 30, characterized in that additive (d) comprises at least one coated or partially coated ingredients selected from the group consisting of calcium oxide and/or magnesium oxide and/or partially hydrated calcium oxide and/or partially hydrated magnesium oxide and/or calcinated dolomite or partially hydrated calcinated dolomite.

32. A process according to anyone of claims 28 to 31, characterized in that additive (e) comprises at least one inorganic filler.

33. A process according to anyone of claims 28 to 32, characterized in that the temperature for mixing the other additives varies between 110°C and 120°C.

34. A process according to anyone of claims 28 to 33, characterized in that the cooling temperature is below 35°C.

35. A process according to any one of claims 27 to 34, characterized in that said plastic material or blend of plastic materials, the coated alkaline earth oxide or hydroxide and/or partially hydrated alkaline earth oxide and the other additives which are solid at ambient temperature, with the exception of titanium dioxide, are premixed in a high-temperature mixer at 35°C to 50°C, the liquid additives being added after an increase in temperature when the temperature has reached between 55°C and 65°C, and mixing is subsequently continued as the temperature is increased to between 100°C and 125°C (calculated as the melt temperature), and the moulding compound is then cooled in a cooling mixer to below 40°C.

36. A process according to claim 35, characterized in that the mixing temperature is ranging from 35°C to 45°C.

37. A process according to claim 35 or 36, characterized in that the temperature wherein liquid additives are being added varies from 57°C to 62°C.

38. A process according to anyone of claims 35 to 37, characterized in that the temperature is increased between 110°C and 120°C.

39. A process according to anyone of claims 35 to 38, characterized in that the cooling temperature is below 35°C.

40. A process according to any one of claims 28 to 39, characterized in that when titanium dioxide is used as a pigment, titanium dioxide is added to the premixed

plastic/additive blend in the high-temperature mixer at temperatures between 90°C and 125°C (calculated as the melt temperature), and that the moulding compound is subsequently cooled in a cooling mixer to temperatures below 40°C.

41. A process according to claim 40, characterized in that the mixing temperature is ranging between 110°C and 120°C.

42. A process according to claims 40 or 41, characterized in that the cooling temperature is below 35°C.

43. The use of an unplasticized polyvinyl-chloride based moulding compound according to anyone of claims 1 to 27 in an extrusion or injection moulding process for the manufacture of profiles or articles.