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(54) **Polyolefin film with improved thermicity.**

(57) The present invention relates to a polyolefin film having a thickness of 100 to 300 µm comprising an additive suitable for enhancing the thermicity of the film, wherein sad additive is present in an amount of 1 to 20 wt% of the film, wherein said additive comprises an alkyl phosphonic acid or derivatives thereof, wherein said film has a thermicity of lower than 25% transmission. Further, the present invention relates to Use of an alkyl phosphonic acid as an additive for increasing the thermicity in a film, preferably in a greenhouse film or in a construction film.

NL C 2011979

POLYOLEFIN FILM WITH IMPROVED THERMICITY

Description

According to a first aspect the present invention relates to polyolefin films having a thermicity of less than 25% transmission. According to a second aspect the present invention relates to the use of an alkyl phosphonic acid as an additive for increasing the thermicity in a film. According to yet another aspect the present invention relates to the use of the present polyolefin films as a greenhouse film.

Historically glass has been used for greenhouse coverings because they provide a long service life and a good ability to transmit light. However, nowadays polyolefin films, such as low density polyethyle (LDPE) polymers are used as a low cost alternative to glass. The use of polyolefin films is practical in that they can be installed easily around plants in order to avoid heat loss.

Solar radiation mainly consisting of ultra violet, visible and near infrared radiation (IR) range, passes through the greenhouse covers and warms up the interior such as plants and soil. Heat thus generated inside the greenhouse during a day will be emitted back to the atmosphere at night. Heat energy dissipation will lead to the temperature drop inside the greenhouse resulting in damage to the plants.

Therefore, films reduce heat loss from a greenhouse during nighttime by trapping the infrared heat radiation from the soil and plants that is normally lost. This helps to maintain optimum plant growth conditions by keeping the average temperature higher plus it extends the growing season by allowing crops to be planted earlier in the spring season and to grow longer in the autumn. To keep thermal loss to a minimum, the thermicity should be as low as possible. Thermicity is a measure of the transmission of IR through a film. The lower the thermicity, the lower the transmission of IR and the lower the heat loss.

A drawback however of polyolefin films is that their thermicity is not optimal due to a radiation window in the mid range of the IR region. Most of the emitted energy lies between 7 to 14 micron (700-1400 cm^{-1}). Usually, the thinner the polyolefin film, the worse the thermicity provided. In order to improve the thermicity and prevent heat IR loss absorbing additives are commonly used. Usually mineral based additives such as silica based minerals, calcinated kaolin clay, crystobalite or fused silica are added to the polyolefin film formula, usually based on copolymer EVA to optimize film thermicity.

However, there remains a need in the art for polyolefin films having an improved thermicity. Specifically there is a need in the art for thin polyolefin films having an improved thermicity without negative side effects such as decreased flammability or transparency.

Therefore, an object of the present invention, amongst other objects, is to provide a polyolefin film having an improved thermicity. Specifically, this object, amongst other objects, is met by providing a polyolefin film according to the appended claim 1.

Specifically, this object is met by providing a polyolefin film comprising an additive suitable for enhancing the thermicity of the film, or IR absorber, wherein said additive, or IR absorber, comprises an alkyl phosphonic acid or derivatives thereof.

Therefore, the present invention relates to a polyolefin film having a thickness of 100 to 300 µm, preferably less than 200 µm, comprising an additive suitable for enhancing the thermicity of the film, wherein said additive is present in an amount of 1 to 20 wt% of the film, wherein said additive comprises an alkyl phosphonic acid or derivatives thereof, wherein said film has a thermicity of lower than 25%, preferably lower than 20%. Formulated differently, the thermicity can be expressed as the amount of not transmitted IR, providing in the present films a thermicity of higher than 75%, preferably higher than 80% or 85%.

Surprisingly, the present inventors found that alkyl phosphonic acids or derivatives thereof provide improved thermicity to polyolefin films. The obtained thermicity is significantly improved versus known polyolefin films, rendering the present film suitable for the protection of plants against mild frost. Furthermore, the present polyolefin film allows an earlier harvest of plants grown under the film, and provides an increase in crop yield and crop quality. It was surprising that polyolefin films having a thickness lower than 300 µm could be provided which still have the improved thermicity. Further, the present polyolefin films have a transparency which suffices for the use of the film as a greenhouse film. Preferably, the present polyolefin film has a thickness of less than 180, 150 or even less than 120 µm.

Thermicity as used in the present context is determined by FTIR spectroscopy as the fraction of mid IR radiation from 700 to 1400 cm^{-1}, or 7 to 14 micron, over the total IR radiation passing through the film. Preferably, the present polyolefin film has a thermicity of lower than 25%, 20% or even lower than 15%.

The improved thermicity according to the present invention is obtained when the present additive suitable for enhancing the thermicity is present when used in an amount of 1 to 20 wt% of the film, preferably 1 to 15 wt%, or 5 to 15 wt%, more preferably in an amount of 5 to 10 wt%. The inclusion of the present additive in this amount provides a colour stabile film with a transparency of the same quality as in commercial available polyolefin films. Further, these indicated amounts allow to produce thin polyolefin films, having a thickness below 200 µm, while the improved thermicity is obtained.

In a preferred embodiment, the present alkyl phosphonic acid is chosen from a methane phosphonic acid, ethane phosphonic acid and propane phosphonic acid, or derivatives thereof such

as a salt or ester thereof. The salt may be an ammonium salt, guanidinium salt, DCDA, guanylurea, melamine, ethylene diamine or a piperazine salt.

In a further preferred embodiment, the present alkyl phosphonic acid is an ammonium salt of an alkyl phosphonic acid, and /or is a phosphonic esther of an alkyl phosphonic acid, since these phosphonic acids provide a particularly improved thermicity when present in small amounts. Further, the present ammonium salt of an alkyl phosphonic acid are available in powder form having a particle size (d99) of approximately 10 µm, which are stable at processing temperatures up to 200 – 250 °C. The present phosphonic esther of an alkyl phosphonic acid is stable up to approximately 280 °C and is particularly useful fully transparent polyolefin films.

In yet another further preferred embodiment, the present alkyl phosphonic acid is chosen from dimethylspirophosphonate, ethylene diamine methane phosphonate and melamine methane phosphonate. These phosphonates provide a transparent thermal polyolefin film having also a reduced flammability. This is advantageous because polyolefin films, and especially the generally used low density polyethylene, is highly flammable which is a risk factor for both plants as workers.

To further reduce the flammability of the present polyolefin films, the films comprise in a preferred embodiment a triazine derivative, preferably selected from a melamine and N,N',N'''-Tris(2,4-bis(1-hydrocarbyloxy-2,2,6,6,-tetramethylpiperidin-4-yl)alkylamino)-s-triazin-6-yl)-3,3'-ethylenediiminodipropylamine. These triazine derivatives provide a synergistic flame retardant compound, especially in combination with dimethylspirophosphonate.

In a preferred embodiment, the present polyolefin films further comprise a stabilization additive chosen from the group consisting of antioxidant, UV stabilizer, UV absorber, chelating agent in an effective stabilizing amount. Further additives which might be present in the present polyolefin films are for example plasticizers, lubricants, rheology additives, catalyst, flow-control agents, optical brighteners, antistatic agents and/or blowing agents. First experiments show that the present additives for enhancing thermicity combine advantageously with UV stabilizers. More specifically, good weathering results are obtained for 4 to 10 years with the present films in combination with a UV stabilizer. In other words, the present invention provides thin films having an improved thermicity, which films are transparent, high flame resistant properties, and UV stabile for at least 4 years.

Preferably, the present polyolefin comprises one or more, such as two or more, three or more, or even four or more, from antifog additives, light diffusing/scattering additives, surface modifiers, processing aids, nucleating agents, foaming agents and nanocomposites.
Another preferred additive in the present polyolefin films are pigments. Preferably, the present polyolefin films further comprise white, coloured and/or black pigments. Suitable white pigments are TiO_2.

The present polyolefin is preferably chosen from the group consisting of polyethylene polymers, or copolymers, EVA polymer, EBA copolymer, 1-2 polybutadiene, hexene, octene, based on Zieggler Natta or Metallocene catalyst technology and mixtures thereof. More preferably, the present polyolefin is (linear) low density polyethylene having for example a density of about 0.92 g/cc. Alternatively, the present polyolefin film is a medium density polyethylene.

The present polyolefin having an improved thermicity can advantageously be used for building and construction films, as well as for greenhouse films. Accordingly, the present invention further relates to a multilayered film comprising the present polyolefin film. Such a greenhouse film may comprise 2 to 10 layers, such as 3, 4, 5, 6, 7, 8, 9 or 10 layers. Preferably the present greenhouse film is a coextruded film. Preferably, the present greenhouse film is produced by blown film extrusion. The widths range of the present greenhouse film is preferably from 1 to 20 meter. Most preferred are 2- and 4- layered coextruded films of a polyethylene or polyethylene copolymer outer layer. Preferably, the thickness of the greenhouse film is within the range of 120 to 250 µm, preferably 120 to 220, more preferably 120 to 180 or 120 to 150 µm.

Given the beneficial properties of the present suitable for enhancing thermicity, the present invention relates according to another aspect to the use of an alkyl phosphonic acid as an additive for increasing the thermicity in a film, preferably in a greenhouse film. Alternatively, the present additive may also be used in a building and/or constructions films and energy screens. Preferably, the present invention relates to the use of the additives suitable for enhancing thermicity in polyolefin films wherein the amount of the additives is of 1 to 20 wt% of the film, preferably 1 to 15 wt%, or 5 to 15 wt%, more preferably in an amount of 5 to 10 wt% of the polyolefin film, such as 6, 7, 8 or 9 wt% of the polyolefin film.

Alternatively, the present invention relates to the use of the present additives for improving the thermicity of polyolefin films lower than 25%, 20% or even lower than 15% transmission. The present invention further relates to the use of the present additives suitable for enhancing thermicity in masterbatches for the preparation of polyethylene films.

Preferably the present invention relates to the present use wherein said alkyl phosphonic acid is chosen from a methane phosphonic acid, ethane phosphonic acid, propane phosphonic acid.

In a preferred embodiment the present invention relates to the use of the present additive wherein said alkyl phosphonic acid is an ammonium salt of an alkyl phosphonic acid, and /or is a phosphonic esther of an alkyl phosphonic acid, since these phosphonic acids provide a particularly improved thermicity when present in small amounts. Further, the present ammonium salt of an alkyl phosphonic acid are available in powder form having a particle size (d99) of approximately 10 µm, which are stable at processing temperatures up to 200 – 250 °C. The present phosphonic esther of an alkyl phosphonic acid is stable up to approximately 280 °C and is particularly useful fully transparent polyolefin films. Accordingly, in a preferred embodiment, the present invention

relates to the use of white powdered ammonium salt of an alkyl phosphonic acid having a d99 size of approximately 10 µm for increasing or improving the thermicity of a polyolefin film.

In a preferred embodiment, the present invention relates to the use of dimethylspirophosphonate, ethylene diamine methane phosphonate and/or melamine methane phosphonate for increasing or improving the thermicity of a polyolefin film, preferably of a greenhouse film having a thickness of 150 to 220 µm. In a preferred embodiment the present invention relates to the use of dimethylspirophosphonate, ethylene diamine methane phosphonate and/or melamine methane phosphonate for increasing or improving the thermicity and reducing the flammability of a polyolefin film.

Ingredients for the production of polyolefin films are commonly provided in masterbatches. A mastserbatch is a concentrated mixture of additives which additives are encapsulated during a heat process into a carrier resin which is then cooled and cut into a granular shape. Therefore, the present defined additive suitable for enhancing the thermicity of a film is advantageously incorporated in a masterbatch. Therefore, the present invention relates, according to a further aspect, to the use of the present alkyl phosphonic acids in a masterbatch to improve thermicity of a film. Further, the present invention relates to a masterbatch, such as an additive masterbatch, comprising the present alkyl phosphonic acid, preferably dimethylspirophosphonate.

The present invention will be elucidated in the following example showing preferred embodiment of the present invention.

Example

Materials

As thermicity additives Aflammit®PCO 700, Aflammit®PCO 800 were used as ammonium salt of an alkyl phosphonic acid and Aflammit®PCO 900 was used as phosphonic esther of an alkyl phosphonic acid. Low density polyethylene (LDPE) was used as carrier.

Sample preparation

Sample 1	LDPE
Sample 2	LDPE + 7.5 wt % Aflammit®PCO 700
Sample 3	LDPE + 7.5 wt % Aflammit®PCO 800
Sample 4	LDPE + 5.5 wt % Aflammit®PCO 900
Sample 5	LDPE + 10 wt % brominated flame retardant + Sb_2O_3.

Table 1

Preparation LDPE films

The ingredients of the samples were prepared by Brabender Internal Mixer at heating until proper melting was obtained. 150 µm films were prepared by blown extrusion on MPM film extruder.

Thermicity analysis

The IR spectra were recorded using Perkin Elmer FTIR spectrophotometer with 2 cm^{-1} resolution. The thermicity was calculated as follows:

Thermicity = $[A_i / A_0]$ x 100%

Wherein A_i is the area integrated under transmittance spectrum between 700 and 1400 cm^{-1} and wherein A_0 is the area between 700 and 1400 cm^{-1} at the case of 100% transmittance.

The accelerated exposure of prepared samples was done on a Q-UV (Q-panel Company) equipped with UV 314 lamps. The duration of exposure cycle was 12h (8h irridation at 40°C sequenced by 4h of dark at 50°C.

Results thermicity

Sample 1	64.9%
Sample 2	23.6%
Sample 3	11.8%
Sample 4	17.6%
Sample 5	50.1%

Table 2

The results in table 2 show that by using ammonium salts of an alkyl phosphonic acid an improved thermicity is provided (sample 2 and 3) in comparison without these additives (sample 1). Further, by using phosphonic esther of an alkyl phosphonic acid an improved thermicity is provided.

Besides thermicity, another important factor for the greenhouse application is the total light transmission and the direct light transmission of the film, in order to transmit as much light as possible through the film. The light transmission is measured and the results are given in table 3 below.

Transparency (% of total transmission):

	Total light transmission (%)
Sample 1	89.5%

Sample 2	87.8%
Sample 3	78.2%
Sample 4	88.4%
Sample 5	60.2%

Table 3

As can be seen in table 3, the transparency of the samples 2, 3 and 4 is not significantly less than the reference LDPE film (sample 1). Accordingly, samples 2, 3 and 4 are suitable for use as a greenhouse film. Further, the direct light transmission of sample 4 was with 62.6% not significantly less than sample 1 (71%), resulting in that sample 4 is of particular relevance for use as a greenhouse film.

In order to test the influence of the present additives on the weathering properties of the films, weathering tests are performed. Specifically, a weathering test according to DIN53384; ISO4892-3; ASTMG154 was carried out with a QUV/se from Q-panel weathering tester, under an UVA lamp of 340 nm with 0.89 W/m^2/nm intension with a cycle of 8 hours at 60 °C followed by 4 hours at 50 °C.

A first sample 'a' was a LDPE film comprising 5 wt% Aflammit®PCO 900, and 7.5 wt% Arguvin UV 155 LD as UV stabilizer. A second sample 'b' was a LDPE film comprising 10 wt% Aflammit®PCO 900, and 7.5 wt% Arguvin UV 155 LD as UV stabilizer.

After the weathering, the residual elongation at break (REB) is measured according to EN ISO527-1; EN ISO527-3. The results are shown in table 4 for sample a and sample b.

Weathering

REB	0 h	250 h	500 h	750 h	1000 h	1250 h	1505 h	1762 h	2021 h
'a'	100%	105.7%	102.8%	98.2%	100.4%	98.5%	99.2%	97.2%	88.6%
'b'	100%	102.4%	99.0%	98.9%	108.6%	100.9%	97.3%	97.1%	86.8%

Table 4

As can be shown in table 4, the weathering is at a high level for 1700 - 2021 hours at least. This corresponds with 400 kly, which is comparable with about 4 years testing in the Benelux. Accordingly, the combination of an additive for enhancing the thermicity with a UV stabilizer provides a film having advantageous weathering properties for at least 4 years.

CLAUSES

1. Polyolefin film having a thickness of 100 to 300 µm comprising an additive suitable for enhancing the thermicity of the film, wherein said additive is present in an amount of 1 to 20 wt% of the film, wherein said additive comprises an alkyl phosphonic acid or derivatives thereof, wherein said film has a thermicity of lower than 25% transmission.

2. Polyolefin film according to clause 1, wherein said alkyl phosphonic acid is chosen from a methane phosphonic acid, ethane phosphonic acid, propane phosphonic acid.

3. Polyolefin film according to any of the preceding clauses, wherein said alkyl phosphonic acid is an ammonium salt of an alkyl phosphonic acid, and /or is a phosphonic esther of an alkyl phosphonic acid.

4. Polyolefin film according to any of the preceding clauses, wherein said alkyl phosphonic acid is chosen from dimethylspirophosphonate, ethylene diamine methane phosphonate and melamine methane phosphonate.

5. Polyolefin film according to any of the preceding clauses, further comprising a triazine derivative, preferably selected from a melamine and N,N',N'''-Tris(2,4-bis(1-hydrocarbyloxy-2,2,6,6,-tetramethylpiperidin-4-yl)alkylamino)-s-triazin-6-yl)-3,3'-ethylenediiminodipropylamine.

6. Polyolefin film according to any of the preceding clauses, further comprising a stabilization additive chosen from the group consisting of antioxidant, UV stabilizer, UV absorber, chelating agent in an effective stabilizing amount.

7. Polyolefin film according to any of the preceding clauses, further comprising one or more from antifog additives, light diffusing/scattering additives, surface modifiers, processing aids, nucleating agents, foaming agents and nanocomposites.

8. Polyolefin film according to any of the preceding clauses, further comprising pigments, preferably white, coloured and/or black pigments.

9. Polyolefin film according to any of the preceding clauses, wherein the polyolefin is chosen from the group consisting of polyethylene polymers, copolymers, EVA polymer, EBA

copolymer, 1-2 polybutadiene, hexene, octene, based on Zieggler Natta or Metallocene catalyst technology and mixtures thereof.

10. Multilayered greenhouse film comprising a polyolefin film according to any of the preceding clauses.

11. Multilayered construction film comprising a polyolefin film according to any of the preceding clauses, wherein said construction film is opaque and/or white.

12. Use of an alkyl phosphonic acid as an additive for increasing the thermicity in a film, preferably in a greenhouse film or in a construction film.

13. Use according to clause 12, wherein said alkyl phosphonic acid is chosen from a methane phosphonic acid, ethane phosphonic acid, propane phosphonic acid.

14. Use according to clause 12 or clause 13, wherein said alkyl phosphonic acid is an ammonium salt of an alkyl phosphonic acid, and /or is a phosphonic esther of an alkyl phosphonic acid.

15. Use according to any of the clauses 12 to 14, wherein said alkyl phosphonic acid is chosen from dimethylspirophosphonate, ethylene diamine methane phosphonate and melamine methane phosphonate.

16. Use of a polyolefin film according to any of the preceding claims in a greenhouse film.

17. Use of an alkyl phosphonic acid, preferably dimethylspirophosphonate, in an additive masterbatch for the preparation of plastic films to improve the thermicity of the film.

18. Masterbatch suitable for the preparation of plastic films, comprising an alkyl phosphonic acid as defined in any of the claims 1 to 4.

CONCLUSIES

1. Polyolefine film met een dikte van 100 tot en met 300 µm omvattende een additief dat geschikt is voor het verbeteren van de thermiciteit van de film, waarbij het genoemde additief aanwezig is in een hoeveelheid van 1 tot en met 20 gewichts % van de film, waarbij het genoemde additief een alkylfosfonzuur of derivaten daarvan omvat, waarbij de genoemde film een thermiciteit heeft van minder dan 25% transmissie.

2. Polyolefine film volgens conclusie 1, waarbij het genoemde alkylfosfonzuur is gekozen uit een methaanfosfonzuur, een ethaanfosfonzuur en een propaanfosfonzuur.

3. Polyolefine film volgens een van de voorgaande conclusies, waarbij het genoemde alkylfosfonzuur een ammoniumzout van een alkylfosfonzuur is, en/of is een fosfon ester van een alkyl fosfonzuur.

4. Polyolefine film volgens een van de voorgaande conclusies, waarbij het genoemde alkylfosfonzuur is gekozen uit dimethylspirofosfonaat, ethyleendiaminemethaanfosfonaat en melaminemethaanfosfonaat.

5. Polyolefine film volgens een van de voorgaande conclusies, verder omvattende een triazine derivaat, bijvoorkeur geselecteerd uit een melamine en N,N',N'"-Tris(2,4-bis(1-hydrocarbyloxy-2,2,6,6,-tetramethylpiperidine-4-yl)alkylamino)-s-triazine-6-yl)-3,3'-ethyleendiiminodipropylamine.

6. Polyolefine film volgens een van de voorgaande conclusies, verder omvattende een stabilisatie additief gekozen uit de groep die bestaat uit antioxidant, UV stabilisator, UV absorbeerder, chelaatvormer, in een effectieve stabiliseren hoeveelheid.

7. Polyolefine film volgens een van de voorgaande conclusies, verder omvattende een of meer van antifog additieven, licht verspreidende / verstrooiende additieven, oppervlakte modificatoren, hulpstoffen, nucleatiemiddelen, schuimmiddelen en nanocomposieten.

8. Polyolefine film volgens een van de voorgaande conclusies,verder omvattende pigmenten, bijvoorkeur witte, gekleurde en/of zwarte pigmenten.

9. Polyolefine film volgens een van de voorgaande conclusies,waarbij de polyolefine is gekozen uit de groep die bestaat uit polyethyleen polymeren of copolymeren, EVA copolymeer, EBA copolymeer, 1-2 polybutadieen, hexeen, octeen, gebaseerd op Zieggler Natta of Metalloceen katalysator technologie, en mengsels daarvan.

10. Een meerlaagse broeikasfilm omvattende een polyolefine film volgens een van de voorgaande conclusies.

11. Een meerlaagse bouwfilm omvattende een een polyolefine film volgens een van de voorgaande conclusies, waarbij de bouwfilm wit en/of ondoorzichtig is.

12. Gebruik van een alkylfosfonzuur als een additief voor het verbeteren van de thermiciteit in een film, bijvoorkeur in een broeikasfilm of een bouwfilm.

13. Gebruik volgens conclusie 12, waarbij het waarbij het genoemde alkylfosfonzuur is gekozen uit een methaanfosfonzuur, een ethaanfosfonzuur en een propaanfosfonzuur.

14. Gebruik volgens conclusie 12 of conclusie 13, waarbij het genoemde alkylfosfonzuur een ammoniumzout van een alkylfosfonzuur is, en/of is een fosfon ester van een alkyl fosfonzuur.

15. Gebruik volgens een van de conclusies 12 tot en met 14, waarbij het genoemde alkylfosfonzuur is gekozen uit dimethylspirofosfonaat, ethyleendiaminemethaanfosfonaat en melaminemethaanfosfonaat.

16. Gebruik van een polyolefine film volgens een van de voorgaande conclusies in aan broeikasfilm.

17. Gebruik van een alkylfosfonzuur, bijvoorkeur dimethylspirofosfonaat, in een additief masterbatch voor de bereiding van plastic folies.

18. Masterbatch geschikt voor de bereiding van plastic folies omvattende een alkylfosfonzuur zoals gedefinieerd in een van de conclusies 1 tot en met 4.

SAMENWERKINGSVERDRAG (PCT)

RAPPORT BETREFFENDE NIEUWHEIDSONDERZOEK VAN INTERNATIONAAL TYPE

IDENTIFICATIE VAN DE NATIONALE AANVRAGE	KENMERK VAN DE AANVRAGER OF VAN DE GEMACHTIGDE
	3S/2PE73/2
Nederlands aanvraag nr. **2011979**	Indieningsdatum **17-12-2013**
	Ingeroepen voorrangsdatum
Aanvrager (Naam) **Hyplast N.V., et al**	
Datum van het verzoek voor een onderzoek van internationaal type **08-03-2014**	Door de Instantie voor Internationaal Onderzoek aan het verzoek voor een onderzoek van internationaal type toegekend nr. **SN 61666**

I. CLASSIFICATIE VAN HET ONDERWERP (bij toepassing van verschillende classificaties, alle classificatiesymbolen opgeven)

Volgens de internationale classificatie (IPC)

C09D5/32

II. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK

Onderzochte minimumdocumentatie

Classificatiesysteem	Classificatiesymbolen
IPC	**C09D**

Onderzochte andere documentatie dan de minimum documentatie, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

III.	☐ **GEEN ONDERZOEK MOGELIJK VOOR BEPAALDE CONCLUSIES**	(opmerkingen op aanvullingsblad)
IV.	☐ **GEBREK AAN EENHEID VAN UITVINDING**	(opmerkingen op aanvullingsblad)

ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Nummer van het verzoek om een onderzoek naar de stand van de techniek
NL 2011979

A. CLASSIFICATIE VAN HET ONDERWERP
INV. C09D5/32
ADD.

Volgens de Internationale Classificatie van octrooien (IPC) of zowel volgens de nationale classificatie als volgens de IPC.

B. ONDERZOCHTE GEBIEDEN VAN DE TECHNIEK

Onderzochte miminum documentatie (classificatie gevolgd door classificatiesymbolen)
C09D

Onderzochte andere documentatie dan de mimimum documentatie, voor dergelijke documenten, voor zover dergelijke documenten in de onderzochte gebieden zijn opgenomen

Tijdens het onderzoek geraadpleegde elektronische gegevensbestanden (naam van de gegevensbestanden en, waar uitvoerbaar, gebruikte trefwoorden)
EPO-Internal, PAJ, WPI Data

C. VAN BELANG GEACHTE DOCUMENTEN

Categorie °	Geciteerde documenten, eventueel met aanduiding van speciaal van belang zijnde passages	Van belang voor conclusie nr.
A	WO 2009/128857 A1 (UNIMIN CORP [US]; KRAGTEN DAVID D [US]; KARR CHRISTY [US]; VAN REMORTE) 22 oktober 2009 (2009-10-22) * conclusies; voorbeelden *	1
A	WO 2012/145438 A2 (DU PONT [US]; GABRIEL SABINE [BE]; KRISHNAMURTHY LAKSHMI [US]; STACHNI) 26 oktober 2012 (2012-10-26) * conclusies *	1

☐ Verdere documenten worden vermeld in het vervolg van vak C.

☒ Leden van dezelfde octrooifamilie zijn vermeld in een bijlage

° Speciale categorieën van aangehaalde documenten

"A" niet tot de categorie X of Y behorende literatuur die de stand van de techniek beschrijft

"D" in de octrooiaanvrage vermeld

"E" eerdere octrooi(aanvrage), gepubliceerd op of na de indieningsdatum, waarin dezelfde uitvinding wordt beschreven

"L" om andere redenen vermelde literatuur

"O" niet-schriftelijke stand van de techniek

"P" tussen de voorrangsdatum en de indieningsdatum gepubliceerde literatuur

"T" na de indieningsdatum of de voorrangsdatum gepubliceerde literatuur die niet bezwarend is voor de octrooiaanvrage, maar wordt vermeld ter verheldering van de theorie of het principe dat ten grondslag ligt aan de uitvinding

"X" de conclusie wordt als niet nieuw of niet inventief beschouwd ten opzichte van deze literatuur

"Y" de conclusie wordt als niet inventief beschouwd ten opzichte van de combinatie van deze literatuur met andere geciteerde literatuur van dezelfde categorie, waarbij de combinatie voor de vakman voor de hand liggend wordt geacht

"&" lid van dezelfde octrooifamilie of overeenkomstige octrooipublicatie

Datum waarop het onderzoek naar de stand van de techniek van internationaal type werd voltooid	Verzenddatum van het rapport van het onderzoek naar de stand van de techniek van internationaal type
11 juli 2014	

Naam en adres van de instantie	De bevoegde ambtenaar
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Devriese, Karel

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ONDERZOEKSRAPPORT BETREFFENDE HET RESULTAAT VAN HET ONDERZOEK NAAR DE STAND VAN DE TECHNIEK VAN HET INTERNATIONALE TYPE

Informatie over leden van dezelfde octrooifamilie

Nummer van het verzoek om een onderzoek naar de stand van de techniek
NL 2011979

In het rapport genoemd octrooigeschrift	Datum van publicatie	Overeenkomend(e) geschrift(en)	Datum van publicatie
WO 2009128857	A1 22-10-2009	CA 2720666 A1	22-10-2009
		CN 102015920 A	13-04-2011
		CO 6260145 A2	22-03-2011
		EP 2268748 A1	05-01-2011
		JP 5480884 B2	23-04-2014
		JP 2011521867 A	28-07-2011
		US 2009260541 A1	22-10-2009
		US 2012171491 A1	05-07-2012
		WO 2009128857 A1	22-10-2009
WO 2012145438	A2 26-10-2012	US 2013109791 A1	02-05-2013
		WO 2012145438 A2	26-10-2012

WRITTEN OPINION

File No.	Filing date *(day/month/year)*	Priority date *(day/month/year)*	Application No.
SN61666	17.12.2013		NL2011979
International Patent Classification (IPC) INV. C09D5/32			
Applicant Hyplast N.V., et al			

This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the application
- ☐ Box No. VIII Certain observations on the application

	Examiner
	Devriese, Karel

Application number

WRITTEN OPINION

NL2011979

Box No. I Basis of this opinion

1. This opinion has been established on the basis of the latest set of claims filed before the start of the search.

2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the application and necessary to the claimed invention, this opinion has been established on the basis of:

   a. type of material:

   ☐ a sequence listing

   ☐ table(s) related to the sequence listing

   b. format of material:

   ☐ on paper

   ☐ in electronic form

   c. time of filing/furnishing:

   ☐ contained in the application as filed.

   ☐ filed together with the application in electronic form.

   ☐ furnished subsequently for the purposes of search.

3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.

4. Additional comments:

Box No. V Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty	Yes:	Claims	1-18
	No:	Claims	
Inventive step	Yes:	Claims	1-18
	No:	Claims	
Industrial applicability	Yes:	Claims	1-18
	No:	Claims	

2. Citations and explanations

see separate sheet

Box 5:

The claimed subject-matter is not disclosed and not obvious having regard to the state of the art.