

## Appeal Decision

Appeal No. 2019-15596

Appellant Yasui Co., Ltd.

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The case of appeal against the examiner's decision of refusal of Japanese Patent Application No. 2015-92300, entitled "RESIN COMPOSITION EXCELLENT IN FLAME RETARDANCY, PROCESSABILITY, TRANSPARENCY, AND MECHANICAL STRENGTH AFTER MOLDING" (the application published on December 15, 2016, Japanese Unexamined Patent Application Publication No. 2016-210823) has resulted in the following appeal decision.

### Conclusion

The appeal of the case was groundless.

### Reason

#### No. 1 History of the procedures

The application was filed on April 28, 2015. In response to a notice of reasons for refusal dated November 30, 2018, and despite the following submission of a written opinion and a written amendment, on April 3, 2019, an examiner's decision of refusal was issued on August 16, 2019. In response to this, an appeal against the examiner's decision of refusal was made on November 20, 2019 and a written amendment was submitted at the same time. A written amendment (formality) was submitted on December 29, 2019.

#### No. 2. Decision to dismiss amendment on the written amendment dated November 20, 2019

##### [Conclusion of Decision to Dismiss Amendment]

The amendment dated November 20, 2019 shall be dismissed.

[Reason]

1. Regarding the Amendment

The amendment dated November 20, 2019 (hereinafter, referred to as "the Amendment") is to amend.

"A resin composition comprising 40 to 82.2% by mass of polycarbonate, 3 to 20% by mass of acetylated lignophenol, and 10 to 20% by mass of a phosphorus-based flame retardancy agent, wherein an antioxidant is included in an amount of 0.07% by mass or less." in Claim 1 of the Scope of Claims before the Amendment, to "A resin composition comprising 40 to 79.7% by mass of polycarbonate, 10 to 20% by mass of acetylated lignophenol, and 10 to 20% by mass of a phosphorus-based flame retardancy agent, wherein an antioxidant is included in an amount of 0.07% by mass or less." (hereinafter, referred to as "the Amended Invention").

2. Propriety of amendment

(1) Regarding the purpose of the Amendment

The Amendment is to restrict the content of polycarbonate from "40 to 82.2% by mass" before the Amendment to "40 to 79.7% by mass" and to restrict the content of acetylated lignophenol from "3 to 20% by mass" to "10 to 20% by mass." The field of industrial application and the problem to be solved of the invention stated in the invention recited in the claim before the Amendment are identical with those recited in the invention recited in the claim after the Amendment. Therefore, the Amendment is to aim at the restriction of the Scope of Claims as stipulated in Article 17-2(5)(ii) of the Patent Act.

(2) Regarding judgment on independent requirements for patentability

It is examined whether or not the Amended Invention could have been patented independently at the time of the patent application (whether or not the Amended Invention complies with the provision of Article 126(7) of the Patent Act which is applied mutatis mutandis pursuant to Article 17-2(6) of the Patent Act).

A Cited Publications

Cited Publication 1: Japanese Unexamined Patent Application Publication No. 2013-204016 (Cited Document 1 in the original examination)

Cited Publication 2: Japanese Unexamined Patent Application Publication No.2013-10038

B Described matters in Cited Publications

(A) Matters described in Cited Publication 1

Cited Publication 1 describes the following matters:

1a "[Scope of Claims]

[Claim 1]

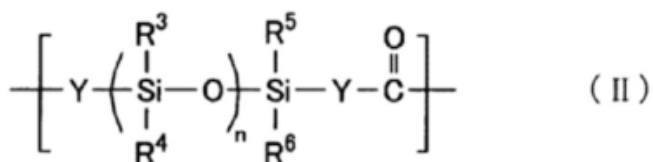
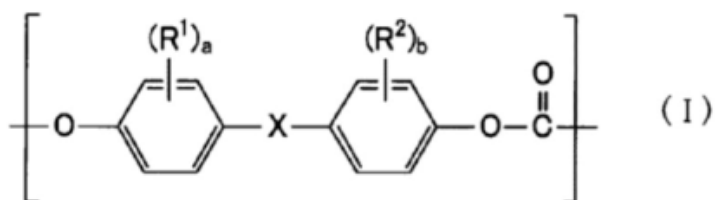
A polycarbonate resin composition comprising a resin mixture consisting of:

(A) 99 to 50% by mass of polycarbonate resin containing a polycarbonate-polyorganosiloxane copolymer having a repeating unit represented by general formula (I) and a structural unit represented by general formula (II) (where  $n = 15$  to  $200$ ) as a main chain; and

(B) 1 to 50% by mass of lignophenols having a partial structure represented by the following general formula (1), wherein

the content of a structural unit represented by general formula (II) is 0.2 to 4% by mass in the resin mixture consisting of the component (A) and the component (B).

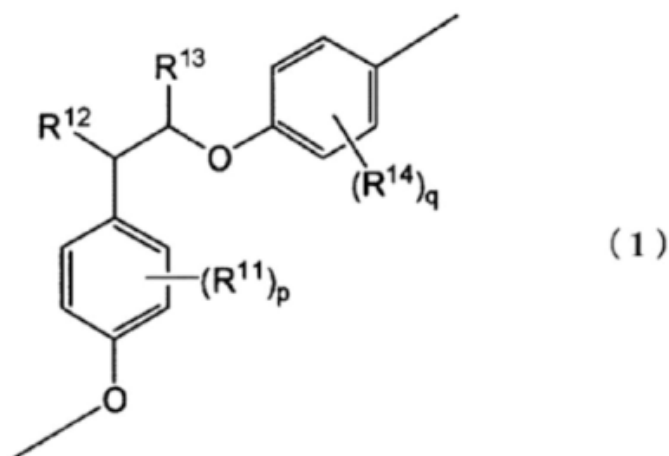
[Chemical 1]



[wherein each of  $\text{R}^1$  and  $\text{R}^2$  independently represents a halogen atom, an alkyl group having 1 to 6 carbon atoms, or an alkoxy group having 1 to 6 carbon atoms; X represents a single bond, an alkylene group having 1 to 8 carbon atoms, an alkylidene group having 2 to 8 carbon atoms, a cycloalkylene group having 5 to 15 carbon atoms, a cycloalkylidene group having 5 to 15 carbon atoms, -S-, or -SO-, -SO<sub>2</sub>-, -O-, or -CO-. Each of a and b independently represents an integer of 0 to 4.

Each of  $\text{R}^3$  to  $\text{R}^6$  independently represents a hydrogen atom, a halogen atom, an alkyl group having 1 to 6 carbon atoms, an alkoxy group having 1 to 6 carbon atoms, or an aryl group having 6 to 12 carbon atoms. Y represents a single bond or an organic residue containing an aliphatic or aromatic group. n is the average number of repetitions.]

[Chemical 2]



[wherein each of  $R^{11}$  and  $R^{14}$  represents an alkyl group, an aryl group, an alkoxy group, an aralkyl group, or a phenoxy group;  $R^{12}$  represents a hydroxyaryl group or an alkyl-substituted hydroxyaryl group;  $R^{13}$  represents a hydroxyalkyl group, an alkyl group, an aryl group, an alkyl substituted aryl group, or  $-OR^{15}$  ( $R^{15}$  represents a hydrogen atom, an alkyl group, or an aryl group); each of  $R^{11}$  to  $R^{15}$  other than the hydrogen atom may have a substituent. Each of  $p$  and  $q$  represents an integer from 0 to 4, but, when  $p$  is 2 or more, a plurality of  $R^{11}$ s may be the same or different. Further, when  $q$  is 2 or more, a plurality of  $R^{14}$ s may be the same or different.]

[Claim 2]

The polycarbonate resin composition of claim 1, comprising:

(C) 0.1 to 50 parts by mass of a phosphorus-based compound with respect to 100 parts by mass of the resin mixture consisting of the component (A) and the component (B).

[Claim 3]

The polycarbonate resin composition of claim 2, wherein the component (C) is a phosphoric acid ester.

[Claim 4]

The polycarbonate resin composition of any one of claims 1 to 3, comprising:

(D) 0.01 to 1 part by mass of polyfluoroolefin resin with respect to 100 parts by mass of the resin mixture consisting of the component (A) and the component (B)."

1b "[Background Art]

[0002]

...

On the other hand, the present inventors first focused on lignophenol derived from wood-based lignin as a biomass material, and have found a polycarbonate resin

composition that has excellent environmental performance as well as high fluidity and high impact resistance, and is excellent in flame retardancy and heat resistance, by blending lignophenols having a specific structure with a polycarbonate resin or a polycarbonate resin blended with polylactic acid (see, for example, Patent Document 1).

...

[Patent Document 1] Japanese Unexamined Patent Application Publication No. 2012-50392

[Summary of Invention]

[Problem to be solved by the invention]

[0004]

...

An object of the present invention is to provide a polycarbonate resin composition having good impact resistance, heat resistance, and color tone, and being excellent in flame retardancy, fluidity, and environmental performance, and to provide a molded product obtained by molding the polycarbonate resin composition."

1c "[Advantage of the Invention]

[0010]

According to the present invention, it is possible to provide a polycarbonate resin composition having good impact resistance, heat resistance, and color tone, and being excellent in flame retardancy, fluidity, and environmental performance, and to provide a molded product obtained by molding the polycarbonate resin composition.

In particular, the use of PC-POS has further improved fluidity as well as impact resistance and flame retardancy. In addition, as a result of the combined use of PC-POS and lignophenols, a synergistic effect was obtained in improving flame retardancy.

Further, when a phosphorus-based compound, particularly a phosphoric acid ester, was contained, not only the flame retardancy but also the color tone was improved. Furthermore, when the polyfluoroolefin resin was contained, not only was the flame retardancy greatly improved, but also the impact resistance and the color tone were improved."

1d "[0017]

In the present invention, the polycarbonate resin of the component (A) contains the above specific PC-POS. As described above, the content of the PC-POS needs to be adjusted such that the constitutional unit represented by the general formula (II) is 0.2 to 4% by mass in the resin mixture consisting of the component (A) and the component (B)

described later. If it is less than 0.2% by mass, the impact resistance and the color tone are deteriorated. On the other hand, if it exceeds 4% by mass, the heat resistance is lowered. From this point of view, in the resin mixture composed of the component (A) and the component (B) described later, the content of the PC-POS is adjusted such that the content of the structural unit represented by the general formula (II) is preferably 0.2 to 3% by mass, more preferably 0.6 to 3% by mass, and still more preferably 0.6 to 3% by mass. ..."

1e "[0019]

Here, in the component (A), the component other than the specific PC-POS may be conventional polycarbonate resin described later, which may be aromatic polycarbonate resin obtained by using an aromatic divalent phenolic compound, aliphatic polycarbonate resin obtained by using an aliphatic dihydric phenolic compound, or aromatic-aliphatic polycarbonate resin obtained by using an aromatic dihydric phenolic compound and an aliphatic dihydric phenolic compound in combination. Among them, the aromatic polycarbonate resin is preferable as a component other than the above specific PC-POS. ..."

1f "[0025]

"(B) lignophenols

In the present invention, lignophenols having partial structures represented by the following general formula (1) are used as the component (B). The component (B) imparts high flame retardancy and fluidity to the polycarbonate resin composition. ... "

1g "[0045]

In the present invention, furthermore, the lignophenols obtained by the above method can be further derivatized by alkali treatment and then subjected to an acylation reaction described later to be used as acylated lignophenols.

Lignophenols obtained from natural lignin by a phase separation process are stable as a whole, because the  $\alpha$ -position of their active carbon is blocked by a phenol derivative. However, under alkaline conditions, the phenolic hydroxyl groups are easily dissociated, and the resulting phenoxide ions attack the  $\beta$ -position of adjacent carbons when sterically possible. As a result, the aryl ether bond at the  $\beta$ -position is cleaved, and the lignophenols are reduced in molecular weight, after which the phenolic hydroxyl group in the introduced phenol nucleus is allowed to be transferred to the lignin matrix. Therefore, it is expected that the alkali-treated lignophenols have improved

hydrophobicity as compared with the lignophenols before the alkali treatment.

At this time, it is also expected that the alkoxide ion present in the carbon at the  $\gamma$ -position or the carbanion of the lignin aromatic nucleus attacks the  $\beta$ -position. However, this requires much higher energy than phenoxide ions. Under mild alkaline conditions, therefore, the effect of the adjacent group of the phenolic hydroxyl group of the introduced phenolic nucleus is preferentially expressed, and a further reaction occurs under more severe conditions. Thus, the phenolic hydroxyl group of the once etherified cresol nucleus is regenerated. As a result, lignophenols are further reduced in molecular weight and have more hydroxyl groups. It is therefore expected that the hydrophilicity will increase.

Further, as described above, by increasing the hydroxyl groups of the lignophenols by the alkali treatment, more acyl groups can be introduced into the lignophenols by the acylation reaction described later.

[0046]

(Acylation)

The lignophenols obtained by the above method and the alkali-treated lignophenols have a phenolic hydroxyl group in the phenol derivative introduced to the  $\alpha$ -position of the side chain, and may further have an alcoholic hydroxyl group. In the present invention, there may be used acylated lignophenols in which the hydrogen atom of the phenolic hydroxyl group and, in some cases, acylated lignophenols in which the hydrogen atom of the alcoholic hydroxyl group is replaced with a hydrophobic acyl group. That is, the lignophenols of the component (B) referred to in the present invention also include acylated lignophenols.

Acylation of lignophenols and alkali-treated lignophenols may be carried out by reacting them with an acylating agent, such as a carboxylic acid, an anhydrous carboxylic acid, or a mixed anhydrous carboxylic acid, and a base may be used in the acylation reaction. The amount of the acylating agent used may be determined according to the desired acylation rate with respect to the hydroxyl values of the lignophenols and alkali-treated lignophenols.

Examples of the acyl group include an acetyl group, a propionyl group, a butyryl group, a valeryl group, and a benzoyl group. Among them, an acetyl group is preferable.

[0047]

In the present invention, the acylation rate of the acylated lignophenols obtained by the acylation reaction is preferably, but not particularly limited to, 25% or more. An acylation rate of 25% or more can sufficiently exert the effect of reducing coloration during molding of polycarbonate resin composition.

Further, the acylation rate of the acylated lignophenols is more preferably 40% or more for the alkali-treated lignophenols, while it is more preferably 40% or more, still more preferably 60% or more for the lignophenols not subjected to the alkali treatment."

1h "[0049]

(Content ratio of component (A) and component (B))

The polycarbonate resin composition of the present invention comprises a resin mixture consisting of 99 to 50% by mass of component (A) and 1 to 50% by mass of component (B). If the content ratio of the component (B) is less than 1% by mass, the effects of improving fluidity and flame retardancy cannot be obtained, while if it exceeds 50% by mass, molding is impossible. From this point of view, the polycarbonate resin composition of the present invention preferably comprises a resin mixture consisting of 98 to 60% by mass of component (A) and 2 to 40% by mass of component (B), and more preferably comprises a resin mixture consisting of 95 to 70% by mass of component (A) and 5 to 30% by mass of component (B)."

1i "[0050]

[(C) Phosphorus-based compound]

The polycarbonate resin composition of the present invention may further comprise a phosphorus-based compound as component (C). By comprising the phosphorus-based compound, the fluidity, flame retardancy, and color tone of the polycarbonate resin composition of the present invention can be further improved. In particular, flame retardancy is preferable because a synergistic effect can be obtained by combination with the component (B).

Examples of the phosphorus-based compound include phosphoric acid esters, phosphite esters, phosphonic acid esters, and phosphines. Of these, phosphoric acid esters and phosphite esters are preferable, and phosphoric acid esters are more preferable from the viewpoint of flame retardancy and color tone.

...

[0062]

When the polycarbonate resin composition of the present invention comprises the component (C), the content thereof is determined from the viewpoint of fluidity, flame retardancy, and color tone. The content of the component (C) is preferably 0.1 to 50 parts by mass, more preferably 0.5 to 25 parts by mass, still more preferably 1 to 20 parts by mass, and particularly preferably 2 to 15 parts by mass with respect to 100 parts by mass of the resin mixture consisting of component (A) and component (B)."



1j "[0063]

[(D) Polyfluoroolefin resin]

The polycarbonate resin composition of the present invention may further comprise a polyfluoroolefin resin as component (D). By containing the polyfluoroolefin resin, the flame retardancy of the polycarbonate resin composition of the present invention can be improved, and the impact resistance and the color tone can also be improved. In particular, for flame retardancy, a synergistic effect can be obtained by combination with the component (B).

The polyfluoroolefin resin is a polymer or copolymer containing a fluoroethylene structure. Examples of the resin include homopolymers such as difluoroethylene polymers and tetrafluoroethylene polymers; and copolymers such as tetrafluoroethylene-hexafluoropropylene copolymers, and copolymers of tetrafluoroethylene and ethylene-based monomer containing no fluorine atom. Among the polyfluoroolefin resins, polytetrafluoroethylene (PTFE) is preferable.

...

[0066]

When the polycarbonate resin composition of the present invention comprises component (D), the content thereof is determined from the viewpoint of impact resistance, flame retardancy, and color tone and from the viewpoint of molten-drop prevention performance in the target flame retardancy. The content of the component (D) is preferably 0.01 to 1 parts by mass, more preferably 0.05 to 1 parts by mass, still more preferably 0.1 to 1 parts by mass, with respect to 100 parts by mass of the resin mixture consisting of component (A) and component (B). Depending on the degree of flame retardancy required for each molded product, for example, V-0, V-1, and V-2 of UL94, the content of the component (D) is appropriately determined in consideration of the amounts of other components used."

1k "[Examples]

[0070]

The present invention will be described in more detail with reference to Examples, but the present invention is not limited thereto.

The resin compositions obtained in each example were subjected to the following performance tests.

(1) Izod Impact Strength (IZOD): Impact resistance

A 1/8 inch-thick test piece was prepared and subjected to measurement of IZOD

impact strength according to ASTM standard D-256 at a measurement temperature of 23°C, and the resulting value was used as an index of impact resistance.

(2) Thermal distortion temperature (deflection temperature under load): heat resistance

The thermal deformation temperature was measured at a load of 1.8 MPa according to ASTM standard D-648, and used as an index of heat resistance.

(3) Yellow index (YI): Color tone (colorability)

Five molded bodies after the 13th shot were prepared, and subjected to the measurement with a measurement area of 30φ by a transmission method of a C2 light source using a spectrophotometer Σ90 manufactured by Nippon Denshoku Industries Co., Ltd. Then, the average value of the results was calculated, indicating that the higher the value, the higher the coloring property and the lower the color tone.

(4) Oxygen index (LOI): Flame retardancy

The oxygen index was measured according to ASTM standard D-2863 and used as an index of flame retardancy. The oxygen index is a value indicating the minimum oxygen concentration required for the test piece to maintain combustion in terms of volume% in air. The higher the value, the better the flame retardancy.

(5) UL94 combustion test: flame retardancy

A vertical combustion test was performed according to the Underwriters Laboratory Subject 94 (UL94) combustion test using a test piece having a thickness of 3 mm.

(6) Melt index (MI): Fluidity

The melt index was measured according to ASTM standard D-1238 at a resin temperature of 260°C and a load of 21.18 N under fluidity measurement conditions, and used as an index of fluidity. The higher the value, the better the fluidity. If the fluidity is high, it is possible to manufacture a large-sized product or a thin-walled product without raising the molding temperature.

[0071]

[Production Example 1] Production of Polycarbonate-Polydimethylsiloxane Copolymer 1 (PC-PDMS 1)

(1. Oligomer synthesis process)

A BPA aqueous sodium hydroxide solution was prepared by adding 2000 ppm of sodium dithionate to bisphenol A (BPA), which was later dissolved in a 5.6 mass% aqueous solution of sodium hydroxide, followed by dissolving BPA therein so that the BPA concentration reached 13.5 mass%. The BPA aqueous sodium hydroxide solution was continuously passed through a tubular reactor having an inner diameter of 6 mm and a tube length of 30 m at a flow rate of 40 L/hr, together with methylene chloride at a flow

rate of 15 L/hr and phosgene at a flow rate of 4.0 kg/hr. The tubular reactor has a jacket part, and the temperature of the reaction solution was kept below 40°C by passing cooling water through the jacket. The reaction solution leaving the tubular reactor was continuously introduced into a tank reactor with a baffle having an internal volume of 40 L and equipped with a sweeping blade, followed by being added with 2.8 L/hr of an aqueous sodium hydroxide solution of BPA, 0.07 L/hr of a 25-mass% aqueous sodium hydroxide solution, 17 L/hr of water, and 0.64 L/hr of a 1-mass% triethylamine aqueous solution to carry out a reaction with them. The reaction solution overflowing from the tank reactor was continuously withdrawn and allowed to stand, to separate and remove an aqueous phase to collect a methylene chloride phase. The polycarbonate oligomer thus obtained had a concentration of 329 g/L and a chloroformate group concentration of 0.74 mol/L.

[0072]

## (2. PC-PDMS 1 production process)

Next, a 50-L tank reactor equipped with a baffle plate, a paddle-type stirring blade, and a cooling jacket was charged with 15 L of the polycarbonate oligomer solution prepared above, 9.0 L of methylene chloride, 1,266 g of allylphenol terminal-modified polydimethylsiloxane (PDMS) having an average number of repetitions (n) of 40 in dimethylsiloxane units, and 8.8 mL of triethylamine, followed by addition of 1,389 g of a 6.4-mass% aqueous sodium hydroxide solution under stirring for 10 minutes to carry out the reaction between the polycarbonate oligomer and the allylphenol terminal-modified PDMS.

The polymerization reaction was carried out for 50 minutes by adding to this polymerization solution both a methylene chloride solution containing p-t-butylphenol (PTBP) (126 g of PTBP dissolved in 2.0 L of methylene chloride) and an aqueous sodium hydroxide solution containing BPA (1,012 g of BPA dissolved in the aqueous solution prepared by dissolving 577 g of NaOH and 2.0 g of sodium dithionite dissolved in 8.4 L of water).

After adding 10 L of methylene chloride for dilution and stirring for 10 minutes, the reaction liquid was separated into an organic phase containing polycarbonate and an aqueous phase containing excess BPA and NaOH, and the organic phase was then isolated.

The methylene chloride solution containing the polycarbonate thus obtained was washed successively with 15% by volume of a 0.03-mol/L NaOH aqueous solution and 0.2-mol/L hydrochloric acid, and then washed with pure water until the electrical conductivity in the aqueous phase after washing reached 0.01  $\mu\text{S}/\text{m}$  or less.

The methylene chloride solution containing the polycarbonate obtained by

washing was concentrated and pulverized, and the obtained flakes were then dried under reduced pressure at 120°C to obtain PC-PDMS 1.

The amount of dimethylsiloxane unit determined by the NMR measurement of the obtained PC-PDMS 1 was 5% by mass, and the viscosity average molecular weight (M<sub>v</sub>) thereof was 19,000.

The copolymer in amount of 100 parts by mass was blended with 0.05 parts by mass of "IRGAFOS168" [Tris (2,4-di-*t*-butylphenyl) phosphite, manufactured by Ciba Specialty Chemicals Co., Ltd.], followed by granulation with a single screw vented extruder of 40 mm in diameter at a resin temperature of 280°C to obtain pellets.

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[0076]

[Production Example 5] Production of lignophenols (lignocresol)

Beech wood flour was immersed in an acetone solution containing *p*-cresol to allow the *p*-cresol to cause sorption to the wood flour. Then, 72% by mass of sulfuric acid was added to the wood flour after the sorption and stirred vigorously. After the stirring was stopped, purified water was added and left to stand, and the operation of decanting the supernatant was repeated 6 times to remove the acid and excess *p*-cresol. The precipitate in the container was dried, followed by addition of acetone thereto to extract lignophenols (lignocresol) having the partial structure of the above formula (2). Then, it was obtained by distilling off acetone.

The detailed procedure was carried out according to Example 1 of Japanese Unexamined Patent Application Publication No. 2001-64494.

[0077]

[Examples 1 to 12 and Comparative Examples 1 to 9]

Components were blended in the ratios (unit: part by mass) shown in Table 1 and supplied to an extruder (model name: VS40, manufactured by Tanabe Plastics Machinery Co., Ltd.), followed by being melt-kneaded at 240°C to obtain pellets of the resin composition. The obtained pellets were dried at 120°C for 12 hours, and then injection-molded using an injection molding machine (model: IS100N, manufactured by Toshiba Machine Co., Ltd.) under the conditions of a cylinder temperature of 260°C and a mold temperature of 80°C to obtain a test piece.

The obtained test piece was subjected to performance tests according to the above method. The results are shown in Tables 1 and 2.

[0078]

[Table 1]

表 1

		実施例												
		1	2	3	4	5	6	7	8	9	10	11	12	
樹脂組成	(A)	PC-PDMS1*1	70	20	10				20	20	20	70		20
		PC-PDMS2*2				28.6		50					20	
		PC-PDMS3*3					5.9							
		PC-PDMS4*4												
		芳香族ポリカーボネート*5	20	70	80	61.4	84.1	30	70	70	70		70	70
	(B)	リグノフェノール類*6	10	10	10	10	10	20	10	10	10	30	10	10
		リン酸エステル1*7							5		5	10		
	(C)	リン酸エステル2*8											5	
		亜リン酸エステル*9												0.2
	(D)	ポリフルオロオレフィン樹脂*10								0.3	0.3	0.3		
ジメチルシロキサン単位	含有量*11 (質量%)	3.5	1	0.5	1	1	1.75	1	1	1	3.5	0.7	1	
	平均繰り返し数(n)	40	40	40	100	150	100	40	40	40	40	100	40	
性能評価	(1) IZOD衝撃強度 (23℃) kJ/m <sup>2</sup>	30	20	15	25	25	20	15	25	20	15	12	20	
	(2) 熱変形温度 °C	108	110	110	107	105	95	100	110	100	85	90	105	
	(3) イエローインデックス (YI)	55	60	65	55	60	60	30	50	25	40	30	65	
	(4) 酸素指数 (LOI) %	36	36	35	37	34	38	38	37	38	40	37	35	
	(5) UL94燃焼試験	V-2	V-2	V-2	V-2	V-2	V-2	V-2	V-0	V-0	V-0	V-2	V-2	
	(6) メルトインデックス (MI) g/10分	20	18	18	18	20	34	25	18	25	40	28	18	

表 1 Table 1

実施例 Example

樹脂組成 Resin composition

芳香族ポリカーボネート Aromatic polycarbonate

リグノフェノール類 Lignophenols

リン酸エステル 1 Phosphate ester 1

リン酸エステル 2 Phosphate ester 2

亜リン酸エステル Phosphite ester

ポリフルオロオレフィン樹脂 Polyfluoroolefin resin

ジメチルシロキサン単位 Dimethylsiloxane unit

含有量 (質量%) Content (% by mass)

平均繰り返し数 Average number of repetitions

性能評価 Performance evaluation

(1) IZOD 衝撃強度 (23℃) (1) IZOD impact strength (23℃)

(2) 熱変形温度 °C (2) Thermal deformation temperature °C

(3) イエローインデックス (YI) (3) Yellow index (YI)

(4) 酸素指数 (LOI) % (4) Oxygen index (LOI)%

(5) UL94 燃焼試験 (5) UL94 combustion test

(6) メルトインデックス (MI) g/10分 (6) Melt index (MI) g/10

minutes

...

[0080]

(Explanation of annotations in Table 1 and Table 2)

\*1: Component (A), PC-PDMS 1 obtained in Production Example 1

...

\*5: Component (A), aromatic polycarbonate resin 'Taflon FN1900A' (manufactured by Idemitsu Kosan Co., Ltd., viscosity average molecular weight = 19,500, homopolycarbonate resin manufactured from bisphenol A)

\*6: Component (B), lignophenols (Lignocresol) obtained in Production Example 5

\*7: Component (C), Phosphate ester 'PX202' (manufactured by Daihachi Chemical Industry Co., Ltd.)

...

\*10: Component (D), PTFE 'CD076' with fibril forming ability (manufactured by Asahi ICI Fluoropolymers Co., Ltd.)

...

\*12: Not measured because it could not be molded

\*13: Fails the UL94 combustion test standard

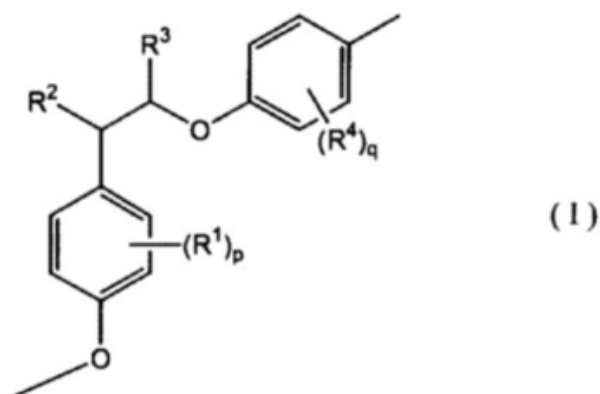
(B) Matters described in Cited Publication 2

Cited Publication 2 describes the following matters:

2a "[Claim 1]

A thermoplastic resin composition comprising 99 to 50% by mass of (A) a thermoplastic resin and 1 to 50% by mass of (B) an acylated lignophenol obtained by acylating a lignophenol having a structure represented by the following general formula (I), with respect to the total amount of a component (A) and a component (B),.

[Chemical 1]



[wherein each of  $R^1$  and  $R^4$  represents an alkyl group, an aryl group, an alkoxy group, an aralkyl group or a phenoxy group;  $R^2$  represents a hydroxyaryl group or an alkyl-substituted hydroxyaryl group;  $R^3$  represents a hydroxyalkyl group, an alkyl group, an aryl group, an alkyl substituted aryl group or  $-OR^5$  ( $R^5$  represents a hydrogen atom, an alkyl group or an aryl group); each of  $R^1$  to  $R^5$  other than the hydrogen atom may have a substituent; and  $p$  and  $q$  represent integers from 0 to 4. However, when  $p$  is 2 or more, a plurality of  $R^1$ 's may be the same or different from each other. Further, when  $q$  is 2 or more, and a plurality of  $R^4$ 's may be the same or different from each other.]

[Claim 2]

The thermoplastic resin composition of Claim 1, wherein an acylation rate of the component (B) is 25% or more.

[Claim 3]

The thermoplastic resin composition of Claim 1 or 2, wherein the component (B) is an acylated lignophenol obtained by alkali-treating a lignophenol having a structure represented by the general formula (I), followed by acylation thereof.

[Claim 4]

The thermoplastic resin composition of any one of Claims 1 to 3, wherein the component (A) is a polycarbonate resin or a mixture of a polycarbonate resin and another thermoplastic resin.

[Claim 5]

A molded product obtained by molding the thermoplastic resin composition of any one of Claims 1 to 4."

2b "[Problems to be solved by the Invention]

[0004]

An object of the present invention is to provide a thermoplastic resin composition

and a molded product using the same, the composition comprising lignophenol blended with thermoplastic resin to suppress coloring during molding and being excellent in thermal stability, moisture heat resistance, and molded appearance while maintaining high functionality, such as flame retardancy and high fluidity."

2c "[0009]

According to the present invention, the use of an acylated lignophenol in which lignophenol is acylated can provide a thermoplastic resin composition having excellent thermal stability, moisture heat resistance, and molded appearance and capable of suppressing coloring during molding while maintaining the flame retardancy and fluidity imparted by lignophenol, and provide a molded product using the same.

Furthermore, since the acylated lignophenol can impart the above properties to the resin composition, it can be expanded to applications requiring the above properties by blending it with various types of thermoplastic resins."

2d "[0046]

(Acylation)

...

Acylation of lignophenol and alkali-treated lignophenol may be carried out by reacting them with an acylating agent, such as a carboxylic acid, an anhydrous carboxylic acid, or a mixed anhydrous carboxylic acid. A base may be used in the acylation reaction. The amount of the acylating agent used may be determined according to the desired acylation rate with respect to the hydroxyl values of lignophenol and alkali-treated lignophenol.

Examples of the acyl group include an acetyl group, a propionyl group, a butyryl group, a valeryl group, and a benzoyl group, and an acetyl group is preferable.

[0047]

In the present invention, the acylation rate of the acylated lignophenol obtained by the acylation reaction is preferably 25% or more. An acylation rate of 25% or more may allow sufficient exertion of the effect of reducing coloration during molding of the thermoplastic resin composition.

Furthermore, in the case of an alkali-treated lignophenol, the acylation rate of the acylated lignophenol is more preferably 40% or more. In the case of an alkali-untreated lignophenol, the acylation rate of the acylated lignophenol is more preferably 40% or more, and further preferably 60% or more."

...



[0049]

(Content ratio)

In the present invention, the content ratio of (B) the acylated lignophenol is 1 to 50% by mass, preferably 2 to 40% by mass, and more preferably 5 to 30% by mass with respect to the total amount of the components (A) and (B); and if the content of (B) in the thermoplastic resin is less than 1% by mass, the effect of improving fluidity and flame retardancy cannot be obtained, and, if it exceeds 50% by mass, impact resistance, flame retardancy, and heat resistance are significantly reduced."

2e "[Examples]

[0053]

The present invention will be described in more detail with reference to Examples, but the present invention is not limited thereto.

The performance test of the resin composition obtained in each example was carried out as follows:

(1) Melt index (MI): Fluidity

Measurement conditions:

Measured according to ASTM standard D-1238 at a measurement condition resin temperature of 260 °C and a load of 2.16 kg.

(2) Izod impact strength (IZOD): Impact resistance

Using a 1/8 inch thick test piece, impact resistance was measured at a measurement temperature of 23°C according to ASTM standard D-256.

(3) Oxygen index (LOI): Flame retardancy

Measured according to ASTM standard D-2863. The oxygen index is a value indicating the minimum oxygen concentration required for the test piece to maintain combustion in terms of volume% in air.

(4) Thermal distortion temperature (deflection temperature under load): Heat resistance

The thermal deformation temperature was measured under a load of 1.8 MPa according to ASTM standard D-648. The thermal deformation temperature gives an indication of heat resistance.

[0054]

(5) Yellow index (YI): Color tone (colorability)

Five molded bodies after the 13th shot were prepared, and subjected to measurement with a measurement area of 30φ by a transmission method of a C2 light source using a spectrophotometer Σ90 manufactured by Nippon Denshoku Industries Co., Ltd. Then, the average value of the results was calculated. Color tone shows the

colorability of the molded product.

(6) Moisture heat resistance

Moisture heat resistance was determined by visually determining the presence or absence of surface deformation after leaving a flat plate-shaped test piece (80 mm × 80 mm × 1 mm) in an environment of 60°C and 95% humidity for 300 hours.

"○" indicates no surface deformation.

"×" indicates swelling and deformation of the surface.

(7) Molded appearance

As for the molding appearance, the presence or absence of silver generation was visually determined on a flat plate-shaped test piece (80 mm × 80 mm × 1 mm) injection-molded at a molding temperature of 260°C

"○" indicates no generation of silver.

"×" indicates generation of silver.

(8) transparency

The transparency was judged by visually observing the molded product.

"○" indicates transparent.

"△" indicates transparent but dimmed.

"×" indicates opaque.

[0055]

Each component used in each example is as follows.

(A) Thermoplastic resin

(1) Polycarbonate resin: Aromatic polycarbonate resin [(trade name) Tarflon A1700, manufactured by Idemitsu Kosan Co., Ltd., viscosity average molecular weight = 17,800]

(2) Polylactic acid: [(trade name) Lasia H100, manufactured by Mitsui Chemicals, Inc.]

2f "[0059]

[Examples 1 to 10 and Comparative Examples 1 to 3]

Each of the above components was blended with a proportion (parts by mass) shown in Table 1, supplied to an extruder (model name: VS40, manufactured by Tanabe Plastic Machinery Co., Ltd.), melt-kneaded at 240°C, and pelletized. In addition, 0.2 parts by mass of Irganox 1076 (manufactured by BASF) as a phenolic antioxidant and 0.1 parts by mass of ADEKA STAB C (manufactured by ADEKA Corporation) as a phosphorus-based antioxidant were blended in all Examples and Comparative Examples, respectively. The resulting pellets were dried at 120°C for 12 hours and then injection-molded under the conditions of an injection molding machine (model: IS100N, manufactured by Toshiba Machine Co., Ltd.) at a cylinder temperature of 260°C and a

mold temperature of 80°C to obtain test pieces. Performance was evaluated by the above performance test using the obtained test pieces. The results are listed in Table 1.

[Reference Example 1]

Test pieces were obtained in the same manner as in the above Examples and Comparative Examples except that an aromatic polycarbonate resin (A) was used without using the component (B) and lignophenol. The performances of the obtained test pieces were evaluated by the above performance test. The results are shown in Table 1.

[0060]

[Table 1]

		アシル化率	実施例1	実施例2	実施例3	実施例4	実施例5	実施例6	実施例7	実施例8	実施例9	比較例1	比較例2	実施例10	比較例3	参考例1	
樹脂組成	(A) 芳香族ポリカーボネート樹脂		90	80	70	60	90	90	90	90	90	90	70	63	63	100	
	ポリ乳酸		—	—	—	—	—	—	—	—	—	—	—	27	27	—	
	アセチル化リグノフェノール (アルカリ処理)	100%	10	20	30	40	—	—	—	—	—	—	—	—	10	—	—
		90%	—	—	—	—	10	—	—	—	—	—	—	—	—	—	—
		85%	—	—	—	—	—	10	—	—	—	—	—	—	—	—	—
	アセチル化リグノフェノール	30%	—	—	—	—	—	—	10	—	—	—	—	—	—	—	—
100%		—	—	—	—	—	—	—	10	—	—	—	—	—	—	—	
リグノフェノール	50%	—	—	—	—	—	—	—	10	—	—	—	—	—	—	—	
		0%	—	—	—	—	—	—	—	—	10	30	—	10	—	—	
性能評価	(1) メルトインデックス (MI) (260°C, 2.16kg)		16	30	40	50	16	15	15	15	14	18	45	35	30	3	
	(2) アイゾット衝撃強度 (IZOD) (23°C) kJ/m <sup>2</sup>		25	20	15	15	25	25	25	20	20	15	10	15	10	75	
	(3) 酸素指数 (LOI) %		31	33	34	35	31	31	31	30	30	31	34	26	26	27	
	(4) 熱変形温度 (高圧重1.8MPa) °C		115	108	100	90	115	115	108	110	108	110	95	120	120	128	
	(5) イエローインデックス (YI)		20	22	25	30	15	20	30	25	30	65	70	10	35	2	
	(6) 耐湿熱性 (60°C, 95%, 300時間) (目視)		○	○	○	○	○	○	△	○	○	×	×	○	×	○	
	(7) 成形外観 (目視)		○	○	○	○	○	○	○	○	○	シルバー	シルバー	○	○	○	
	(8) 透明性 (目視)		○	○	△	△	○	○	△	○	△	×	×	×	×	○	

表 1 Table 1

アシル化率 Acylation rate

実施例 Example

比較例 Comparative example

樹脂組成 Resin composition

芳香族ポリカーボネート樹脂 Aromatic polycarbonate resin

ポリ乳酸 Poly(lactic acid)

アセチル化リグノフェノール (アルカリ処理) Acetylated lignophenol (alkaline treatment)

アセチル化リグノフェノール Acetylated lignophenol

リグノフェノール Lignophenol

性能評価 Performance evaluation

(1) メルトインデックス (MI) (260°C, 2.16 kg) (1) Melt index (MI) (260°C, 2.16 kg)

(2) アイゾット衝撃強度 (IZOD) (23°C) kJ/m<sup>2</sup> (2) Izod impact strength (IZOD) (23°C) kJ/m<sup>2</sup>

(3) 酸素指数 (LOI) % (3) Oxygen index (LOI)%

- (4) 熱変形温度 (高加重 1.8 MPa) °C (4) Thermal deformation temperature (high load 1.8 MPa) °C
- (5) イエローインデックス (YI) (5) Yellow index (YI)
- (6) 耐湿熱性 (60°C、95%、300時間) (目視) (6) Moisture heat resistance (60°C, 95%, 300 hours) (visual)
- (7) 成形外観 (目視) (7) Molded appearance (visual)
- (8) 透明性 (目視) (8) transparency (visual)
- シルバー Silver

"

#### C Invention disclosed in Cited Publication 1

In Cited Publication 1, Claim 4, which depends from Claim 3, which depends from Claim 2, which depends from Claim 1, states as follows:

"A polycarbonate resin composition comprising a resin mixture consisting of:

(A) 99 to 50% by mass of polycarbonate resin containing a polycarbonate-polyorganosiloxane copolymer having a repeating unit represented by general formula (I) and a structural unit represented by the general formula (II) (where  $n = 15$  to 200) as a main chain; and

(B) 1 to 50% by mass of lignophenol having a partial structure represented by the following general formula (1), wherein

the content of a structural unit represented by general formula (II) is 0.2 to 4% by mass in a resin mixture consisting of the component (A) and the component (B), wherein the composition comprises (C) 0.1 to 50 parts by mass of a phosphorus-based compound with respect to 100 parts by mass of the resin mixture consisting of the component (A) and the component (B), the component (C) is a phosphoric acid ester, and (D) 0.01 to 1 part by mass of polyfluoroolefin resin with respect to 100 parts by mass of the resin mixture consisting of the component (A) and the component (B) (Note by the body: the statements of the general formulas (I), (II), and (1) are omitted)." (the above 1a).

In addition, Cited Publication 1 describes as Example 9, which is a specific example of the polycarbonate resin composition of Claim 4, a polycarbonate resin composition consisting of: 20 parts by mass of "PC-PDMS 1 produced in Production Example 1" as Component (A); 70 parts by mass of aromatic polycarbonate; 10 parts by mass of "lignophenols (lignocresol) produced in Production Example 5" as Component (B); 5 parts by mass of "Phosphate ester 1" (Phosphate Ester "PX202" (manufactured by Daihachi Chemical Industry Co., Ltd.)) as Component (C); and 0.3 parts by mass of

polyfluoroolefin resin as Component (D).

Here, the above "PC-PDMS 1" is a specific example of the polycarbonate-polyorganosiloxane copolymer (PC-POS), which is the polycarbonate stated in Claim 1.  $R^3$  to  $R^5$  in the general formula (II) are methyl groups, and Y in the general formula (II) is a single-bonded polycarbonate-polydimethylsiloxane copolymer (the content of dimethylsiloxane unit is 5% by mass) (the above 1k).

Furthermore, the total amount of the polycarbonate resin composition of Example 9 is 105.3 parts by mass. When the blending amount of each component added is converted into mass%, the blending amount of "PC-PDMS 1" is 18.99% by mass, the blending amount of aromatic polycarbonate is 66.48% by mass, the blending amount of lignocresol, which is lignophenols, is 9.50% by mass, and the blending amount of phosphoric acid is 4.75% by mass, and the blending amount of 0.28% by mass of polyfluoroolefin resin.

Then, it is recognized that Cited Publication 1 describes "a polycarbonate resin composition comprising: 18.99% by mass of a polycarbonate-polydimethylsiloxane copolymer (including 5% by mass of dimethylsiloxane unit), which is polycarbonate; 66.48% by mass of aromatic polycarbonate; 9.50% by mass of lignocresol, which is lignophenols; 4.75% by mass of phosphate ester, and 0.28% by mass of polyfluoroolefin resin" (hereinafter, referred to as "Cited Invention A").

## D Regarding the Amended Invention

### (A) Comparison

The Amended Invention and Cited Invention A are compared.

Since "a polycarbonate-polydimethylsiloxane copolymer (including 5% by mass of dimethylsiloxane unit)" in Cited Invention A is one of polycarbonate resins (the above 1a and 1d), "a polycarbonate-polydimethylsiloxane copolymer (including 5% by mass of dimethylsiloxane unit)" and "aromatic polycarbonate" correspond to the "polycarbonate" stated in the Amended Invention.

In addition, the "phosphate ester" of Cited Invention A is a compound that imparts flame retardancy to the resin composition (the above 1i), and can be said to be a flame retardant. Thus, it corresponds to the "phosphorus-based flame retardancy agent" of the Amended Invention. Then, the "polycarbonate resin composition" of Cited Invention A corresponds to the "resin composition" of the Amended Invention.

Furthermore, "lignocresol, which is lignophenols" in Cited Invention, A can be said to be the same as "acetylated lignophenol" in the Amended Invention so long as it is

lignophenols.

Then, in Cited Invention A, as stated above, both the polycarbonate-polydimethylsiloxane copolymer and the aromatic polycarbonate are polycarbonate resins, and the total amount thereof is 85.47% by mass. Therefore, it can be said that the Amended Invention and Cited Invention A are common in that they are compositions containing polycarbonate as a main component.

In addition, Cited Invention A is free of any antioxidant.

Then, it can be said that the Amended Invention and Cited Invention A are the same in that each of them is "a resin composition comprising polycarbonate as a main component and comprising lignophenols and a phosphorus-based flame retardancy agent, wherein an antioxidant is included in an amount of 0.07% by mass or less" and differ from each other in the following features:

(Different Feature 1) The amount of polycarbonate is "40 to 79.7% by mass" in the Amended Invention, whereas it is "85.47% by mass" in Cited Invention A.

(Different Feature 2) The type and blending amount of lignophenols are stated as "10 to 20% by mass of acetylated lignophenol" in the Amended Invention, but "9.50% by mass of lignocresol" in Cited Invention A.

(Different Feature 3) The blending amount of the phosphorus-based flame retardancy agent is "10 to 20% by mass" in the Amended Invention, whereas it is "4.75 mass%" in Cited Invention A.

## (B) Examination

### a Regarding the blending amounts in Different Feature 1 and Different Feature 2

In Cited Publication 1, regarding the resin mixture consisting of Component (A) and Component (B), from the viewpoint of improving fluidity and flame retardancy and moldability, the blending amount of Component (A) is 50 to 99% by mass and the blending amount of Component (B) is 1 to 50 by mass (Summarized Matter 1h). It is also suggested that the blending amount of component (A) can be reduced to the same level as component (B). In the examples, there is also provided a specific example in which the blending amount of component (A) is 70 parts by mass and the blending amount of component (B) is 30 parts by mass (Table 1 of the above 1k).

Then, it can be said that a person skilled in the art would be motivated to reduce the blending amount of component (A) and increase the blending amount of component (B), and could easily conceive of reducing the blending amount of a polycarbonate resin as component (A) from 85.47% by mass to 40 to 79.5% by mass and increasing the

blending amount of lignophenols as component (B) from 9.5% by mass to 10 to 20% by mass.

b Regarding "acetylated lignophenol" in Different Feature 2

Cited Publication 1 describes that the lignophenols contained in the resin composition include acylated lignophenols from the viewpoint of the effect of reducing coloration, and the acyl group is preferably an acetyl group (the above 1g).

Cited Publication 2 describes that the use of acetylated lignophenols as the acylated lignophenol to be contained in the thermoplastic resin composition comprising a carbonate resin can improve fluidity and flame retardancy and exert an excellent effect of reducing coloration (the above 2c and 2d). Furthermore, from the comparison between Examples 1 and 8 and Comparative Example 1 as well as the comparison between Example 10 and Comparative Example 3 of Cited Publication 2, it can also be confirmed that the value of the yellow index, which is an index of colorability, can be reduced by using acetylated lignophenol instead of lignophenol (the above 2f).

Thus, a person skilled in the art could easily conceive of using acetylated lignophenol as lignophenols in Cited Invention A instead of lignocresol so that the effect of reducing coloration of the resin composition can be obtained.

c Regarding Different Feature 3

Cited Publication 1 describes that the blending amount of phosphoric acid ester, which is component (C), is preferable in a range of 0.5 to 25 parts by mass with respect to 100 parts by mass of the resin mixture consisting of components (A) and (B) from the viewpoint of fluidity, flame retardancy, and color tone (the above 1i). As stated in the above c, the blending amount of component (C) in Cited Invention A is 5 parts by mass. Thus, it can be said that a person skilled in the art would be motivated to increase the blending amount of component (C) based on the above description of Cited Publication 1.

Therefore, a person skilled in the art could easily conceive of defying the blending amount of component (C) in a range of 4.75% by mass to 10 to 20% by mass in Cited Invention A.

(C) Regarding the effects of the Amended Invention

The specification of the present invention describes that "According to the present invention, it is possible to provide a resin composition having excellent flame retardancy,

processability, transparency, and mechanical strength after molding." ([0015]). Specifically, from comparison between Examples 1 and 2 and Comparative Example 1, it can be confirmed that the Amended Invention improves fluidity ("MFR" value) and flame retardancy (the value of "total flame burning time") by using acetylated lignophenol. In addition, from comparison between Examples 1 and 2 and Example 3, it can be confirmed that the blending ratio of the Amended Invention provides the resin composition with excellent fluidity and predetermined flame retardancy and transparency.

On the other hand, Cited Publication 1 describes that the resin composition has "excellent environmental performance as well as high fluidity and high impact resistance, and is excellent in flame retardancy and heat resistance, by blending lignophenols having a specific structure" (the above 1b), "when a phosphorus-based compound, particularly a phosphoric acid ester, was contained, not only the flame retardancy but also the color tone was improved" (the above 1c), and, in the acylation of lignophenol, "an acylation rate of 25% or more can sufficiently exert the effect of reducing coloration during molding of polycarbonate resin composition" (the above 1g).

Cited Publication 2 describes that "the use of an acylated lignophenol in which lignophenol is acylated can provide a thermoplastic resin composition having excellent thermal stability, moisture heat resistance, and molded appearance and capable of suppressing coloring during molding while retaining the flame retardancy and fluidity imparted by lignophenol, and provide a molded product using the same" (the above 2c"). From comparison between Examples 1 and 5 to 9 and Comparative Example 1 and comparison between Example 3 and Comparative Example 2, the inclusion of acetylated lignophenol provides transparency, impact resistance, thermal stability, and moisture resistance. Thus, it can be specifically confirmed that the thermal properties and the molded appearance are improved.

Then, the above effects on fluidity, flame retardancy, and transparency, which can be specifically confirmed in the Amended Invention, cannot be said to be particularly remarkable, because a person skilled in the art could predict the effects from the descriptions in Publications 1 and 2.

#### (D) Regarding Appellant's allegation

In the written amendment (formality) of the written request for appeal, the Appellant alleges as follows: "Comparative Example 2 of 0% by mass of acetylated lignophenol has a flame burning time of 11 (s). Example 3 of 7.5% by mass of acetylated lignophenol has a flame burning time of 38 (s). In other words, adding acetylated lignophenol to polycarbonate improves processability, but significantly



increases the flame burning time. However, Example 2 of 10% by mass of acetylated lignophenol has a flame burning time of 8 (s), and, compared to Example 3, the flame burning time is shorter than that of Example 3. That is, the invention recited in the claims of the present application has a content of acetylated lignophenol of 10% by mass or more, thereby not only improving processability as compared with the case where only polycarbonate is used as the resin but also shortening the flame burning time despite the addition of acetylated lignophenol. Therefore, the invention recited in the claims of the present application has an excellent effect that cannot be expected from Cited Documents 1 to 4."

However, the "total flame burning time" in Comparative Example 2 containing no acetylated lignophenol is 11 seconds, while that in Example 1 containing an amount of 15.0% by mass, which is within the range of the acetylated lignophenol of Invention 1, is 29 seconds. It is thus not recognized that setting the blending amount of acetylated lignophenol to 10% by mass or more can exert not only an effect of improving processability but also an effect of shortening the flame burning time.

Therefore, the above allegation cannot be adopted.

### (3) Summary

As stated above, the Amended Invention could be easily achieved by a person skilled in the art based on the inventions disclosed in Cited Publications 1 and 2 distributed in Japan before the filing date of the present application. Therefore, the Amended Invention should not be patented under the provisions of Article 29(2) of the Patent Act, and should not be granted a patent for it independently at the time of patent application.

### 3 Closing on the decision to dismiss amendment

Therefore, since the Amendment violates the provisions of Article 126(7) of the Patent Act which is applied *mutatis mutandis* pursuant to the provisions of Article 17-2(6) of the Patent Act, the written amendment at the time of submitting the written request for appeal should be dismissed under the provisions of Article 53(1) of the Patent Act applied *mutatis mutandis* by replacing certain terms pursuant to Article 159(1) of the Patent Act.

Therefore, the decision is made in accordance with Conclusion of Decision to Dismiss Amendment.

### No. 3 Regarding the invention

## 1 The Invention

As the amendment dated November 20, 2019 was dismissed as above, the invention of the present application is specified by matters stated in Claims 1 to 6 of the Scope of Claims, which have been amended by the written amendment dated April 3, 2019, and the invention recited in Claim 1 (hereinafter referred to as "the Invention") is as follows:

"A resin composition comprising 40 to 82.2% by mass of polycarbonate, 3 to 20% by mass of acetylated lignophenol, and 10 to 20% by mass of a phosphorus-based flame retardancy agent, wherein an antioxidant is included in an amount of 0.07% by mass or less."

## 2 Reasons for refusal stated in the examiner's decision

The summary of the reasons for refusal of the examiner's decision is that the invention of the present application could have been easily made by a person having ordinary skill in the art to which the invention pertains, on the basis of the Inventions disclosed in Cited Publications 1 and 2 distributed prior to the filing of this application. Therefore, the Invention should not be patented in accordance with the provisions of Article 29(2) of the Patent Act.

## 3 Cited Documents

Cited Publications 1 and 2 cited in the reasons for refusal stated in the examiner's decision as well as described matters in these publications are as described in the above No. 2, 2(2) A and B.

Then, in Cited Publication 1, Cited Invention A is described as stated in No. 2, 2(2).

## 4 Comparison / judgement

In the invention of the present application, "40 to 79.7% by mass of polycarbonate" in the Amended Invention examined in Reason 2(2) is rewritten to "40 to 82.2% by mass of polycarbonate" as stated before the Amendment, and "10 to 20% by mass of acetylated lignophenol" in the Amended Invention is rewritten to "3 to 20% by mass of acetylated lignophenol" before the Amendment.

Furthermore, as stated in the above No. 2 [Reason] 2(2), the Amended Invention including all of the matters specifying the Invention of the present application could have been easily invented by a person skilled in the art based on the invention disclosed in Cited Publication 1 and the matters described in Cited Publications 1 and 2. Therefore,

the Invention of the present application could be also invented by a person skilled in the art based on the invention disclosed in Cited Publication 1 and the matters described in Cited Publications 1 and 2.

#### No. 4 Closing

As stated above, the Invention of the present application could have been easily invented by a person skilled in the art based on the invention disclosed in Cited Publication 1 and the matters described in Cited Publications 1 and 2. Thus, the Appellant should not be granted a patent for the Invention in accordance with the provisions of Article 29(2) of the Patent Act. Therefore, the application should be rejected without examining inventions recited in other claims.

Therefore, the appeal decision shall be made as described in the conclusion.

September 14, 2020

Chief administrative judge: SATO, Takefumi  
Administrative judge: KONNO, Mitsutomo  
Administrative judge: YASUDA, Shuji