

LIQUID CRYSTAL RESIN COMPOSITION

TECHNICAL FIELD

The present invention relates to a liquid crystal resin composition.

BACKGROUND ART

Liquid crystal resins as represented by liquid crystal polyester resins, which have excellent mechanical strength, thermal resistance, chemical resistance, electrical properties, and the like in a properly balanced manner, and also have excellent dimensional stability, are widely used as high-performance engineering plastics. Meanwhile, in recent years, remarkable technical advances have been achieved in the fields of information and communication, including mobile phones; wireless LAN; and the ITS technologies such as GPS, VICS[®] and ETC. Accordingly, there have been increasing demands for high-performance high-frequency electronic parts which can be used in high-frequency regions such as microwave and millimeterwave. Materials of which such electronic parts will be made need to have proper dielectric properties, depending on the designs of individual electronic parts.

For example, Patent Document 1 discloses that a molded article of a wholly aromatic liquid crystal polyester resin composition having a relative permittivity of 3.0 or less and a dielectric dissipation factor of 0.04 or less, which can be obtained by injection-molding a composition including 90 to

45% by weight of a wholly aromatic liquid crystal polyester having a melting point of 320°C or more; 10 to 40% by weight of an inorganic spherical hollow body having an aspect ratio of 2 or less; and 0 to 15% by weight of an inorganic filler having an aspect ratio of 4 or more, has thermal resistance such as solder-reflow resistance, and excellent dielectric properties, and can be used in a member for fixing or holding a transmission/reception part of an information and communication device compatible with the high-frequency bands such as microwave and millimeterwave.

Patent Document 1: Japanese Unexamined Patent Application, Publication No. 2004-27021

DISCLOSURE OF THE INVENTION

Problems to be Solved by the Invention

A conventional liquid crystal resin composition containing a hollow filler such as an inorganic spherical hollow body was found to have significantly high melt viscosity and poor fluidity according to our studies. Here, the increased melt viscosity of the liquid crystal resin composition means neither an increased molecular weight nor improved thermal resistance of a liquid crystal resin itself in the liquid crystal resin composition. Therefore, the liquid crystal resin may be decomposed when a molding temperature is increased in response to the increased melt viscosity of the liquid crystal resin composition. This is not preferred as a method of improving the moldability of the liquid crystal resin

composition.

The present invention is made in order to solve the aforementioned problems. An object of the present invention is to provide a liquid crystal resin composition having a good moldability and a low permittivity.

Summary

In one aspect, there is provided a liquid crystal resin composition comprising (A) a liquid crystal resin and (B) a hollow filler having an aspect ratio of 1.15 or more, wherein component (B) is a glass balloon, and the aspect ratio is an arithmetic mean value of a ratio L/S calculated for individual particles by repeating several measurements of the largest length L and the largest perpendicular length S for each of 3000 particles by the dynamic image analysis method with a particle-state analyzer, in which L represents a length of the longest portion on a projection plane of a particle, and S represents a length of the longest portion in a direction perpendicular to the largest length L on the projection plane of the particle.

Means for Solving the Problems

The present inventors conducted extensive studies in order to solve the aforementioned problems. Then, the present inventors found that use of a hollow filler having an aspect ratio of 1.15 or more can prevent an increase in melt viscosity and an decrease in fluidity, leading to production of a liquid crystal resin composition having a good

moldability and a low permittivity. Then the present invention has been completed. More specifically, the present invention provides the followings.

(1) A liquid crystal resin composition comprising (A) a liquid crystal resin and (B) a hollow filler having an aspect ratio of 1.15 or more.

(2) The composition according to (1), in which the component (B) is a glass balloon.

(3) The composition according to (1) or (2), in which the content of the component (A) is 60% by mass or more and 95% by mass or less, and the content of the component (B) is 5% by mass or more and 20% by mass or less.

(4) The composition according to (1) or (2), further comprising (C) a plate-shaped filler.

(5) The composition according to (4), in which the

component (C) is mica.

(6) The composition according to (4) or (5), in which the content of the component (A) is 60% by mass or more and less than 95% by mass, the content of the component (B) is 5% by mass or more and 20% by mass or less, and the content of the component (C) is more than 0% by mass and 20% by mass or less.

Effects of the Invention

The present invention can provide a liquid crystal resin composition having a good moldability and a low permittivity.

BRIEF DESCRIPTION OF THE DRAWINGS

FIGs. 1A to 1C each show a histogram of frequency distribution and cumulative frequency distributions of a ratio L/S measured for individual particles of the following glass balloons 1 to 3, respectively (in which L represents the largest length as a length of the longest portion on a projection plane of a particle, and S represents the largest perpendicular length S as a length of the longest portion in a direction perpendicular to the largest length L on the projection plane of the particle).

FIG. 2 shows a top view of a cutting position of a test piece for measuring a relative permittivity used in Examples and Comparative Examples.

PREFERRED MODE FOR CARRYING OUT THE INVENTION

Below, the embodiments of the present invention will be described. It is noted that the present invention shall not be

limited to the following embodiments.

<Liquid crystal resin composition>

The liquid crystal resin composition according to the present invention comprises (A) a liquid crystal resin and (B) a hollow filler having an aspect ratio of 1.15 or more.

[(A) Liquid crystal resin]

The liquid crystal resin (A) for use in the present invention refers to a melt-processable polymer which can form an optical anisotropic molten phase. The property of an anisotropic molten phase can be detected by a conventional polarization inspection method using orthogonal polarizers. More specifically, an anisotropic molten phase can be detected by observing a molten sample mounted on a Leitz hot stage at a magnification of 40 times under a nitrogen atmosphere using a Leitz polarizing microscope. A liquid crystal polymer applicable to the present invention sandwiched between orthogonal polarizers would allow polarized light to pass therethrough even in a molten stationary state. This is indicative of optical anisotropy.

There is no particular limitation for the liquid crystal resin (A) as described above, but it is preferably an aromatic polyester and/or an aromatic polyester amide. A polyester partly including an aromatic polyester and/or an aromatic polyester amide in the same molecular chain also falls within the scope of the present invention. As the liquid crystal resin (A), those may preferably be used having a logarithmic viscosity (I.V.) of preferably at least about 2.0 dl/g, more

preferably 2.0 to 10.0 dl/g when dissolved in pentafluorophenol at a concentration of 0.1% by mass at 60°C.

In particular, an aromatic polyester or aromatic polyester amide as the liquid crystal resin (A) which can be used in the present invention preferably has, as a constituent component, a constituent unit derived from at least one compound selected from the group consisting of aromatic hydroxycarboxylic acids, aromatic hydroxyamines, and aromatic diamines.

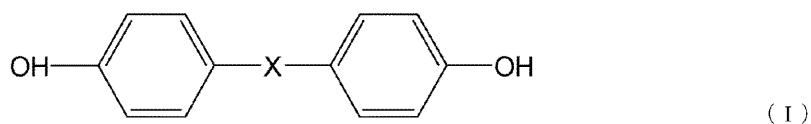
More specific examples include:

- (1) a polyester consisting mainly of a constituent unit derived from one or two or more of aromatic hydroxycarboxylic acids and derivatives thereof;
- (2) a polyester consisting mainly of (a) a constituent unit derived from one or two or more of aromatic hydroxycarboxylic acids and derivatives thereof, (b) a constituent unit derived from one or two or more of aromatic dicarboxylic acids, alicyclic dicarboxylic acids, and derivatives thereof, and (c) a constituent unit derived from one or two or more of aromatic diols, alicyclic diols, aliphatic diols, and derivatives thereof;
- (3) a polyester amide consisting mainly of (a) a constituent unit derived from one or two or more of aromatic hydroxycarboxylic acids and derivatives thereof, (b) a constituent unit derived from one or two or more of aromatic hydroxyamines, aromatic diamines, and derivatives thereof, and (c) a constituent unit derived from one or two or more of aromatic dicarboxylic acids, alicyclic dicarboxylic acids, and

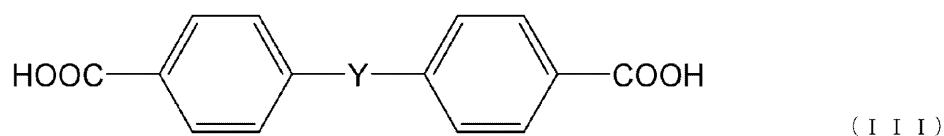
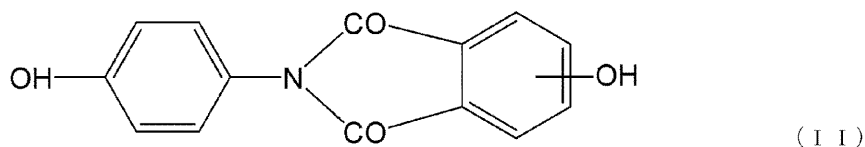
derivatives thereof;

(4) a polyester amide consisting mainly of (a) a constituent unit derived from one or two or more of aromatic hydroxycarboxylic acids and derivatives thereof, (b) a constituent unit derived from one or two or more of aromatic hydroxyamines, aromatic diamines, and derivatives thereof, (c) a constituent unit derived from one or two or more of aromatic dicarboxylic acids, alicyclic dicarboxylic acids, and derivatives thereof, and (d) a constituent unit derived from one or two or more of aromatic diols, alicyclic diols, aliphatic diols, and derivatives thereof. A molecular weight modifier may be used in combination with the above constituent components, if required.

Preferred examples of a specific compound which constitutes the liquid crystal resin (A) which can be used in the present invention include aromatic hydroxycarboxylic acids such as p-hydroxybenzoic acid and 6-hydroxy-2-naphthoic acid; aromatic diols such as 2,6-dihydroxynaphthalene, 1,4-dihydroxynaphthalene, 4,4'-dihydroxybiphenyl, hydroquinone, resorcin, a compound represented by the following general formula (I) and a compound represented by the following general formula (II); aromatic dicarboxylic acids such as terephthalic acid, isophthalic acid, 4,4'-diphenyldicarboxylic acid, 2,6-naphthalenedicarboxylic acid, and a compound represented by the following general formula (III); and aromatic amines such as p-aminophenol, p-phenylenediamine, and 4-acetoxyaminophenol.



(X: a group selected from alkylene (C_1 to C_4), alkylidene, $-O-$, $-SO-$, $-SO_2-$, $-S-$, and $-CO-$)



(Y: a group selected from $-(CH_2)_n-$ ($n = 1$ to 4) and $-O(CH_2)_nO-$ ($n = 1$ to 4))

The liquid crystal resin (A) for use in the present invention can be prepared from the aforementioned monomer compounds (or a mixture of monomers) by a known method such as the direct polymerization method or the transesterification method, but the melt polymerization method, the slurry polymerization method, or the like is usually used. The aforementioned compounds may be directly polymerized in their original forms when they are capable of forming esters, or denatured from precursors into derivatives capable of forming esters before polymerization. These polymerizations may be effected with various catalysts. Typical catalysts include dialkyltin oxide, diaryltin oxide, titanium dioxide, alkoxytitanium silicates, titanium alcoholates, alkaline metal and alkaline earth metal salts of carboxylic acid, and salts of Lewis acid such as BF_3 , and the like. The amount of a

catalyst to be used is generally about 0.001 to 1% by mass relative to the total mass of a monomer(s), in particular preferably about 0.01 to 0.2% by mass. Polymers manufactured according to these polymerization methods may be further subjected to solid state polymerization where the polymers are heated under reduced pressure or under an inert gas in order to increase their molecular weights, if desired.

There is no particular limitation for the melt viscosity of the liquid crystal resin (A) obtained by the methods as described above. In general, those can be used having a melt viscosity of 10 MPa or more and 600 MPa or less at a shear rate of 1000 sec^{-1} under a molding temperature. However, those themselves having excessively high viscosity are not preferred because they may result in highly deteriorated fluidity. It is noted that the liquid crystal resin (A) as desired above may be a mixture of two or more liquid crystal resins.

The content of the component (A) in the liquid crystal resin composition according to the present invention is preferably 60% by mass or more and 95% by mass or less, more preferably 64% by mass or more and 93% by mass or less, and even more preferably 69% by mass or more and 90% by mass or less. In particular, when the liquid crystal resin composition according to the present invention includes the plate-shaped filler (C), the content of the component (A) in the liquid crystal resin composition according to the present invention is preferably 60% by mass or more and less than 95%, more preferably 64% by mass or more and 93% by mass or less, and

even more preferably 69% by mass or more and 90% by mass or less. When the content of the component (A) is 60% by mass or more, improved fluidity tends to be obtained upon melting of the resulting composition. When the content of the component (A) is 95% by mass or less or less than 95% by mass, the resulting liquid crystal resin composition tends to have a low permittivity because the content of the component (B) is secured sufficiently.

[(B) Hollow filler having aspect ratio of 1.15 or more]

The hollow filler (B) is generally referred to as a balloon. Materials for hollow spheres include, for example, inorganic materials such as alumina, silica, and glass; and organic materials such as urea resins and phenol resins. Among these, glass is preferred in view of thermal resistance and strength. That is, a glass balloon is suitably used as the hollow filler. The component(s) (B) may be used alone or in combination of two or more.

The hollow filler (B) having an aspect ratio of 1.15 or more has larger anisotropy as compared with a hollow filler having an aspect ratio of less than 1.15. Therefore, a highly oriented molecular structure, which can confer good fluidity on a liquid crystal resin, is not easily disturbed in a composition containing the hollow filler (B). This can likely tend to prevent increased melt viscosity and deteriorated fluidity.

In order to prevent increased melt viscosity and deteriorated fluidity, the aspect ratio of the hollow filler

(B) is 1.15 or more, preferably 1.20 or more and 2.00 or less, more preferably 1.22 or more and 1.50 or less, and even more preferably 1.25 or more and less than 1.30.

As used herein, the aspect ratio refers to a mean value of a ratio L/S calculated for individual particles by repeating several measurements of the largest length L and the largest perpendicular length S for each of 3000 particles by the dynamic image analysis method with a particle-state analyzer, in which L represents a length of the longest portion on a projection plane of a particle, and S represents a length of the longest portion in a direction perpendicular to the largest length L on the projection plane of the particle.

The mean particle size of the component (B) is preferably 5 μm or more, more preferably 10 μm or more in view of moldability, and is preferably 200 μm or less, more preferably 100 μm or less, and even more preferably 50 μm or less in view of destruction prevention of the component (B) and moldability. It is noted that the mean particle size of the component (B) as used herein represents a value (D50) as measured by a method of measuring particle size distribution based on laser diffraction/dispersion.

The content of the component (B) in the liquid crystal resin composition according to the present invention is preferably 5% by mass or more and 20% by mass or less, more preferably 7% by mass or more and 18% by mass or less, even more preferably 10% by mass or more and 15% by mass or less. When the content of the component (B) is 5% by mass or more,

the resulting liquid crystal resin composition tends to have a low permittivity. When the content of the component (B) is 20% by mass or less, improved fluidity tends to be obtained upon melting of the resulting composition.

[(C) Plate-shaped filler]

The liquid crystal resin composition according to the present invention may optionally include the plate-shaped filler (C). The plate-shaped filler (C) may act as an anti-warpage filler in a molded article of a liquid crystal resin composition. The component(s) (C) may be used alone or in combination of two or more.

According to our studies, a conventional liquid crystal resin composition including a hollow filler was found to result in a molded article susceptible to large warpage, and further addition of an anti-warpage filler such as a plate-shaped filler to the above conventional liquid crystal resin composition for reducing warpage was found to further deteriorate fluidity. In contrast, use of the hollow filler (B) having an aspect ratio of 1.15 or more in the liquid crystal resin composition according to the present invention can maintain good fluidity while reducing warpage of the resulting molded article even when the plate-shaped filler (C) is added. This will provide superior dimensional stability.

The plate-shaped filler (C) preferably has a mean particle size of 15 to 50 μm . When the mean particle size is 15 μm or more, desired mechanical strength tends to be obtained, and the effect for reducing warpage of the resulting molded

article tends to be larger. When the mean particle size is 50 μm or less, improved fluidity tends to be obtained upon melting of the resulting composition. The mean particle size is preferably 20 to 30 μm . It is noted that the mean particle size of the component (C) as used herein represents a value (MV) as measured by a method of measuring particle size distribution based on laser diffraction/dispersion.

There is no particular limitation for the plate-shaped filler (C), and examples thereof include mica, talc, glass flake, graphite, various metal foils (for example, an aluminum foil, an iron foil, a copper foil), and the like. Mica is preferably used as the component (C) in the present invention.

The content of the component (C) in the liquid crystal resin composition according to the present invention is preferably more than 0% by mass and 20% by mass or less, more preferably 5% by mass or more and 18% by mass or less, and even more preferably 10% by mass or more and 16% by mass or less. When the content of the component (C) is more than 0% by mass, desired mechanical strength tends to be obtained, and the effect for reducing warpage of the resulting molded article tends to be larger. When the content of the component (C) is 20% by mass or less, improved fluidity tends to be obtained upon melting of the resulting composition.

[Other components]

Other polymers, other fillers, known substances which are commonly added to synthetic resins, i.e., stabilizing agents such as antioxidants and ultraviolet light absorbers,

antistatic agents, flame retardants, coloring agents such as dyes and pigments, lubricants, release agents, crystallization promoting agents, crystal nucleating agents may also appropriately be added to the liquid crystal resin composition according to the present invention depending on required performance as long as the effects of the present invention are not impaired.

Other polymers include, for example, epoxy group-containing copolymers. Other fillers mean fillers other than the hollow filler (B) and the plate-shaped filler (C), and examples thereof include a fibrous filler such as glass fiber; a granular filler such as silica; carbon black.

[Preparation of liquid crystal resin composition]

There is no particular limitation for preparation of the liquid crystal resin composition according to the present invention. For example, the component (A), the component (B), optionally the component (C), and optionally other components are blended, and subjected to melt-kneading using a single or twin screw extruder to prepare a liquid crystal resin composition.

[Liquid crystal resin composition]

The liquid crystal resin composition according to the present invention obtained as described above preferably has a melt viscosity of less than 45 Pa·sec, more preferably 42 Pa·sec or less, and even more preferably 40 Pa·sec or less. One of the advantageous characteristics of the liquid crystal resin composition according to the present invention is that

it has high fluidity upon melted, and has an excellent moldability. Melt viscosity as used herein refers to a value obtained by a measurement method in accordance with ISO 11443 under conditions of a cylinder temperature higher than the melting point of a liquid crystal resin by 10 to 30°C and a shear rate of 1000 sec⁻¹.

The liquid crystal resin composition according to the present invention preferably has a relative permittivity of 3.2 or less, more preferably 3.1 or less, and even more preferably 3.0 or less. Another advantageous characteristic of the liquid crystal resin composition according to the present invention is that it has a low permittivity.

EXAMPLES

Below, the present invention will be described in more detail with reference to Examples, but the present invention shall not be limited to only these Examples.

<Liquid crystal resin>

- Liquid crystal polyester amide resin (LCP1)

The following raw materials were charged into a polymerization vessel, and the reaction system was then heated to a temperature of 140°C, and allowed to react at 140°C for 1 hour. Subsequently, the temperature was further increased to 340°C over 4.5 hours, and depressurization was then performed down to 10 Torr (that is, 1330 Pa) over 15 minutes, and melt polymerization was performed while distilling off acetic acid, excess acetic anhydride, and other low-boiling fractions.

After stirring torque reached a predetermined value, nitrogen was introduced to achieve a pressurized condition from the reduced pressure condition via the ordinary pressure, thereby discharging a polymer through a lower portion of the polymerization vessel. The resulting strand was then pelletized to obtain pellets. The resulting pellets were heat-treated at 300°C for 2 hours under a nitrogen stream to obtain a polymer of interest. The resulting polymer had a melting point of 334°C and a melt viscosity of 19.0 Pa·s at 350°C. It is noted that the melt viscosity of the above polymer was measured by a method similar to the method of measuring melt viscosity described below.

(I) 4-hydroxybenzoic acid (HBA); 188.4 g (60 mol%)

(II) 2-hydroxy-6-naphthoic acid (HNA); 21.4 g (5 mol%)

(III) terephthalic acid (TA); 66.8 g (17.7 mol%)

(IV) 4,4'-dihydroxybiphenyl (BP); 52.2 g (12.3 mol%)

(V) 4-acetoxymino phenol (APAP); 17.2 g (5 mol%)

Metal catalyst (potassium acetate catalyst); 15 mg

Acylating agent (acetic anhydride); 226.2 g

• Liquid crystal polyester resin (LCP2)

The following raw materials were charged into a polymerization vessel, and the reaction system was then heated to a temperature of 140°C, and allowed to react at 140°C for 1 hour. Subsequently, the temperature was further increased to 360°C over 5.5 hours, and depressurization was then performed down to 5 Torr (that is, 667 Pa) over 30 minutes, and melt polymerization was performed while distilling off acetic acid,

excess acetic anhydride, and other low-boiling fractions. After stirring torque reached a predetermined value, nitrogen was introduced to achieve a pressurized condition from the reduced pressure condition via the ordinary pressure, thereby discharging a polymer through a lower portion of the polymerization vessel. The resulting strand was then pelletized to obtain pellets. The resulting pellets were heat-treated at 300°C for 8 hours under a nitrogen stream to obtain a polymer of interest. The resulting polymer had a melting point of 352°C and a melt viscosity of 27.0 Pa·s at 380°C. It is noted that the melt viscosity of the above polymer was measured by a method similar to the method of measuring melt viscosity described below.

(I) 2-hydroxy-6-naphthoic acid (HNA); 166 g (48 mol%)

(II) terephthalic acid (TA); 76 g (25 mol%)

(III) 4,4'-dihydroxybiphenyl (BP); 86 g (25 mol%)

(IV) 4-hydroxybenzoic acid (HBA); 5 g (2 mol%)

Metal catalyst (potassium acetate catalyst); 22.5 mg

Acylating agent (acetic anhydride); 191 g

<Materials other than liquid crystal resin>

- Glass balloon 1: Y12000 (Seishin Enterprise Co., Ltd., aspect ratio (mean): 1.264, mean particle size (D50): 35 μm)
- Glass balloon 2: S60HS (Sumitomo 3M Limited, aspect ratio (mean): 1.091, mean particle size (D50): 24 μm)
- Glass balloon 3: im30K (Sumitomo 3M Limited, aspect ratio (mean): 1.072, mean particle size (D50): 18 μm)
- Plate-shaped filler: AB-25S (Yamaguchi Mica Co., Ltd., mean

particle size (MV): 24 μm)

• Fibrous filler: ECS03T-786H (Nippon Electric Glass Co., Ltd., glass fiber, fiber diameter: 10 μm , a chopped strand of 3 mm in length)

<Manufacture of liquid crystal resin composition>

The above components in the compositions shown in Table 1 were melt kneaded at the following cylinder temperatures using a twin screw extruder (Japan Steel Works, Ltd., Model TEX30 α) to obtain pellets of liquid crystal resin compositions.

[Manufacturing conditions]

Cylinder temperature:

350°C for a liquid crystal resin composition including a liquid crystal polyester amide resin (LCP1)

370°C for a liquid crystal resin composition including a liquid crystal polyester resin (LCP2)

<Measurement of aspect ratio of glass balloon>

The largest length L and the largest perpendicular length S were measured for 3000 particles of a glass balloon by the dynamic image analysis method with a particle-state analyzer "PITA-3" available from Seishin Enterprise Co., Ltd., in which L represents a length of the longest portion on a projection plane of a particle as measured under 4 $\times$ optical lenses equipped with the analyzer, and S represents a length of the longest portion in a direction perpendicular to the largest length L on the projection plane of the particle. The measurement as described above were repeated for several times to obtain a histogram of the frequency distribution of a ratio

L/S calculated for each particle, from which the mean value of the ratio L/S was calculated, which was used as the aspect ratio of the glass balloon. For the measurements, a glass balloon was diluted with a diluent aqueous solution containing an appropriate amount of a surfactant to adjust a concentration of the glass balloon to 3.3 mg/mL, and the glass balloon was dispersed into the above aqueous solution by ultrasonic washing to obtain a glass balloon dispersion, which was used as a measurement sample. It is noted that FIGs. 1A to 1C each show a histogram of the frequency distribution and cumulative frequency distribution of the ratio L/S calculated for individual particles of the glass balloons 1 to 3, respectively.

<Melt viscosity>

The liquid crystal resin compositions from Examples and Comparative Examples were measured for melt viscosity using the pellets obtained as described above. Specifically, an apparent melt viscosity was measured in accordance with ISO 11443 under conditions of a temperature higher than the melting point of a liquid crystal resin by 10 to 30°C and a shear rate of 1000 sec⁻¹ with a capillary rheometer (Toyo Seiki Seisaku-Sho Ltd., Capirograph 1D with a piston diameter of 10 mm). An orifice with an inner diameter of 1 mm and a length of 20 mm was used for measurements. It is noted that specifically, the measurement temperature was 350°C for a liquid crystal resin composition containing a liquid crystal polyester amide resin (LCP1), and

380°C for a liquid crystal resin composition containing a liquid crystal polyester resin (LCP2). Results are shown in Table 1.

<Flatness>

Pellets from Examples and Comparative Examples were each molded with a molding machine (Sumitomo Heavy Industries, Ltd., "SE-100DU") under the following molding conditions to prepare five 80 mm × 80 mm × 1 mm plate-shaped test pieces. A first plate-shaped test piece was placed on a horizontal surface, and the mean height was computed from values of height from the level plane measured at 9 points of the plate-shaped test piece using a CNC image measurement machine available from Mitutoyo Corporation (Model :QVBHU404-PRO1F). The positions at which the height was measured correspond to each apex of a square with each side of 74 mm, a mid point of each side of the square, and a point of intersection of the two diagonal lines of the square when the square is placed on the main surface of the plate-shaped test piece so that the distance from each side of the main surface is 3 mm. A surface parallel to the above level plane in which the height from the above level plane is identical to the above mean height was used as the reference surface. The maximum and minimum heights from the reference surface were selected among the heights measured at the above 9 points, and the difference between them was calculated. This difference was calculated for the 4 other plate-shaped test pieces, and the resulting 5 individual values were averaged to obtain a flatness value. Results are

shown in Table 1.

[Molding conditions]

Cylinder temperature:

350°C for a liquid crystal resin composition including a
liquid crystal polyester amide resin (LCP1)

370°C for a liquid crystal resin composition including a
liquid crystal polyester resin (LCP2)

Mold temperature: 80°C

Injection rate: 33 mm/sec

Holding pressure: 60 MPa

<Relative permittivity>

Pellets from Examples and Comparative Examples were each molded with a molding machine (Sumitomo Heavy Industries, Ltd., "SE-100DU") under the following molding conditions to prepare five 80 mm × 80 mm × 1 mm plate-shaped test pieces. As shown in FIG. 2, a 80 mm × 1 mm × 1 mm test piece was cut out from the center of the plate-shaped test piece at right angle to the flow. This was used as a test piece for measuring a relative permittivity. This test piece was measured for a relative permittivity at 1 GHz with a complex permittivity evaluation device using the cavity resonator perturbation method, the device being available from Kanto Electronic Application and Development Inc., and the device having the following constitution.

Scalar network analyzer: an Agilent Technologies 8757D

Frequency synthesizer: an Agilent Technologies 83650L sweep CW generator

Fixed attenuator: an Agilent Technologies 85025D detector

Cavity resonator: a Kanto Electronic Application and

Development CP431

Measurement program: a Kanto Electronic Application and

Development CPMA-S2/V2

[Molding conditions]

Cylinder temperature:

350°C for a liquid crystal resin composition including a

liquid crystal polyester amide resin (LCP1)

370°C for a liquid crystal resin composition including a

liquid crystal polyester resin (LCP2)

Mold temperature: 80°C

Injection rate: 33 mm/sec

Holding pressure: 60 MPa

[Table 1]

Unit for content of each component: % by mass		Example 1	Example 2	Comparative Example 1	Comparative Example 2	Comparative Example 3	Example 3	Comparative Example 4	Comparative Example 5
Liquid crystal resin	LCP1	75		75		70	85	85	85
	LCP2		75		75				
Glass balloon	Y12000	10	10				15		
	S60HS			10	10			15	
	im30K								15
Plate-shaped filler	Mica	15	15	15	15				
Fibrous filler	Glass fiber					30			
Total		100	100	100	100	100	100	100	100
Melt viscosity	Pa·s	31	40	45	70	35	34	53	61
Flatness	mm	0.6	1.2	1.2	1.5	4.8	5.2	3.2	6.9
Relative permittivity	—	3.0	3.0	3.0	3.0	3.4	2.8	2.7	2.8

As clearly understood from the results shown in Table 1, the liquid crystal resin compositions from Examples had a good

moldability and a low permittivity. Further, the liquid crystal resin compositions from Examples maintained a good moldability even after mica was added.

CLAIMS

1. A liquid crystal resin composition comprising (A) a liquid crystal resin and (B) a hollow filler having an aspect ratio of 1.15 or more, wherein component (B) is a glass balloon, and the aspect ratio is an arithmetic mean value of a ratio L/S calculated for individual particles by repeating several measurements of the largest length L and the largest perpendicular length S for each of 3000 particles by the dynamic image analysis method with a particle-state analyzer, in which L represents a length of the longest portion on a projection plane of a particle, and S represents a length of the longest portion in a direction perpendicular to the largest length L on the projection plane of the particle.
2. The composition according to claim 1, wherein a content of component (A) is 60% by mass or more and 95% by mass or less, and a content of component (B) is 5% by mass or more and 20% by mass or less.
3. The composition according to claim 1, further comprising (C) a plate-shaped filler.
4. The composition according to claim 3, wherein component (C) is mica.
5. The composition according to claim 3 or 4, wherein a content of component (A) is 60% by mass or more and less than 95% by mass, a content of component (B) is 5% by mass or more and 20% by mass or less, and a content of component (C) is more than 0% by mass and 20% by mass or less.