SUMMARY OF INVENTION

Problem to be Solved by the Invention

**[0005]** However, since Patent Document 1 mixes an epoxy resin using furfural as a raw material with a phenol novolac resin, which is a petrochemical-derived curing agent, to form an epoxy resin composition, the biomass content of the composition is low.

**[0006]** Generally, an attempt to increase the biomass content makes it difficult to maintain the performance required for a curable resin composition, and therefore, there has been a demand for a curable resin composition that has high biomass content while satisfying the required properties.

**[0007]** The present invention has been made in view of the above situation, and aims to provide a curable resin composition that has high biomass content and has excellent high heat resistance, low dielectric properties, and mechanical properties, and a cured product thereof.

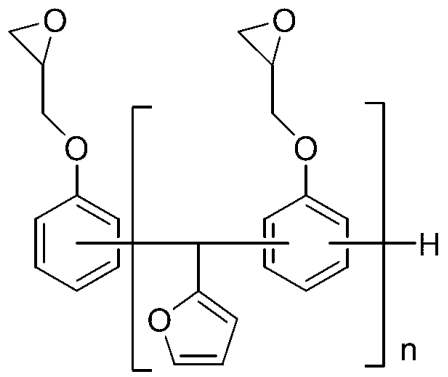
Means for Solving the Problem

**[0008]** That is, the present invention relates to the following [1] to [8]. It is noted that in the present invention, "(numerical value 1) to (numerical value 2)" indicates that the upper and lower limit values are included.

[1]

A curable resin composition, including an epoxy resin represented by the following formula (1) and a lignin-modified phenolic resin or cashew-modified phenolic resin.

**[0009]**




**(1)**

and has excellent high heat resistance, low dielectric properties, and mechanical properties. Therefore, the present invention is useful as insulating materials for electrical and electronic components (such as high-reliability semiconductor encapsulant materials), laminates (such as printed wiring boards and buildup substrates), various composite materials including CFRP, adhesives, and the like.

## BRIEF DESCRIPTION OF THE DRAWINGS

**[0012]**

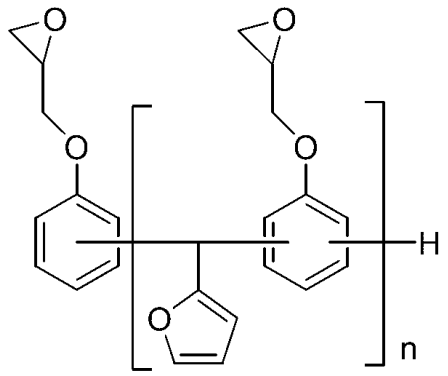
[FIG. 1] shows the GPC chart of Synthesis Example 1.

[FIG. 2] shows the GPC chart of the lignin-modified phenolic resin used in Example 1.

## DESCRIPTION OF THE EMBODIMENTS

**[0013]** The curable resin composition of this embodiment includes an epoxy resin represented by the following formula (1) and a lignin-modified phenolic resin or cashew-modified phenolic resin.

**[0014]**




**(1)**

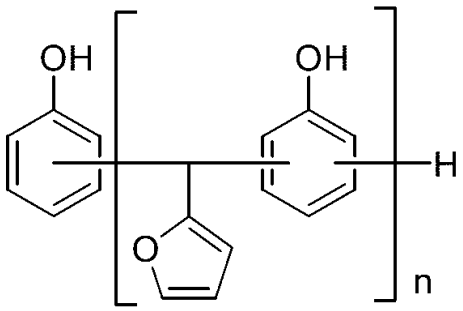
**[0015]** (In formula (1), n is an average value of the number of repetitions and represents a real number satisfying 1<n<15.)

**[0016]** In formula (1), the value of n can be calculated from the number average molecular

weight determined by gel permeation chromatography (GPC, detector: RI) measurement of the epoxy resin, or from the area ratio of each separated peak. n is preferably a real number satisfying 1<n<15, more preferably 1<n<10, and particularly preferably 1<n<5.

**[0017]** The epoxy resin represented by formula (1) can be obtained by reacting a phenolic resin represented by the following formula (2) with epihalohydrin.

**[0018]**




(2)

**[0019]** (In formula (2), n is an average value of the number of repetitions and represents a real number satisfying 1<n<15.)

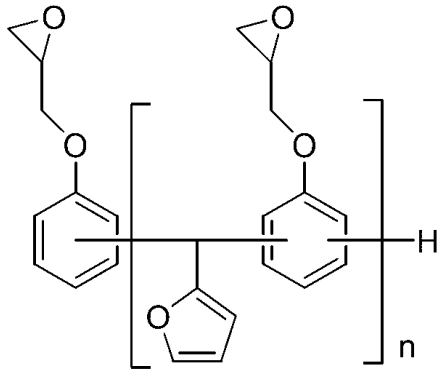
**[0020]** The preferred range of n in formula (2) is the same as the range in formula (1).

**[0021]** The epihalohydrin can be easily obtained from the market. The usage amount of epihalohydrin is preferably 2.0 mol to 10 mol, more preferably 3.0 mol to 8.0 mol, and even more preferably 3.5 mol to 6.0 mol, per 1 mol of hydroxyl groups in the raw material phenol mixture.

**[0022]** In the above reaction, an alkali metal hydroxide can be used as a catalyst to promote the epoxidation step. Examples of alkali metal hydroxides that can be used include sodium hydroxide, potassium hydroxide, etc., and solid materials may be utilized or aqueous solutions thereof may be used. However, in this embodiment, it is particularly preferable to use solid materials molded into flakes from the viewpoint of solubility and handling.

CLAIMS

[Claim 1] A curable resin composition, comprising an epoxy resin represented by the following formula (1) and a lignin-modified phenolic resin or cashew-modified phenolic resin,



(1)

(in formula (1), n is an average value of the number of repetitions and represents a real number satisfying 1<n<15).

[Claim 2] The curable resin composition according to claim 1, wherein the lignin-modified phenolic resin or cashew-modified phenolic resin has a biomass content of 20% or more.

[Claim 3] The curable resin composition according to claim 1, wherein the epoxy resin has an ICI viscosity (150°C) of 0.01 Pa·s to 0.20 Pa·s.

[Claim 4] The curable resin composition according to claim 1, having a biomass content of 20% or more.

[Claim 5] The curable resin composition according to any one of claims 1 to 4, which is for carbon fiber reinforced plastic.

[Claim 6] The curable resin composition according to any one of claims 1 to 4, which is for semiconductor device encapsulant.

[Claim 7] The curable resin composition according to any one of claims 1 to 4, which is for printed wiring board.

[Claim 8] A cured product, obtained by curing the curable resin composition according to any one of claims 1 to 4.