

CLAIMS

1. A method for producing a material for filling a bone defect formed of a biodegradable fiber having calcium phosphate particles and calcium carbonate particles doped with silicon species both homogeneously dispersed in the fiber, comprising the steps of:

melting a biodegradable polymer by using a kneader;

adding the calcium phosphate particles and the calcium carbonate particles doped with silicon species both having approximately spherical shape and equal outer diameter to the melted biodegradable polymer;

mixing and kneading the melted biodegradable polymer with the calcium phosphate particles and calcium carbonate particles doped with silicon species in the kneader and then cooling and solidifying the kneaded mixture of the components at a room temperature to produce a composite;

dissolving the composite by a solvent to produce a spinning solution having a predetermined polymer concentration; and

electrospinning the spinning solution to produce a biodegradable fiber, wherein the calcium phosphate particles and the calcium carbonate particles doped with silicon species are homogeneously dispersed in the biodegradable polymer each other without being unevenly distributed in a specific portion of the biodegradable fiber.

2. The method of claim 1, wherein the calcium phosphate is β -TCP.

3. The method of claim 1 or 2, wherein the calcium carbonate is of vaterite phase.

4. The method of any one of the claims 1-3, wherein outer diameters of the calcium phosphate particles and of the calcium carbonate particles doped with silicon species are both 1-2 μm .

CLAIMS

[Claim 1]

A cotton-like structure material for filing a bone defect comprising a biodegradable fiber produced by electrospinning,

wherein the biodegradable fiber comprises calcium phosphate particles in an amount of 40% to 60% by weight, silicon-releasing calcium carbonate particles in an amount of 10% by weight or more, and a poly-L-lactic acid polymer in an amount of 30% by weight or more as the remainder, and

wherein, an amount of amorphous phase of the poly-L-lactic acid polymer is from 75% to 98% by weight.

[Claim 2]

The material for filing a bone defect of claim 1, wherein, an amount of an amorphous phase of the poly-L-lactic acid polymer is from 85% by weight to 95% by weight.

[Claim 3]

The material for filing a bone defect of claim 1 or 2, wherein the calcium phosphate is β -TCP.

[Claim 4]

The material for filing a bone defect of any one of the claims 1 to 3, wherein the biodegradable fiber is produced by heat kneading a mixture of poly L lactic acid melt, silicon-releasing calcium carbonate particles, and calcium phosphate particles by using a kneader to obtain a composite; dissolving the obtained composite with a solvent to produce a spinning solution, and electrospinning the produced spinning solution.

[Claim 5]

The material for filing a bone defect of any one of

the claims 1 to 4, wherein the silicon-releasing calcium carbonate contains siloxane in an amount of 2% to 4% by weight.

[Claim 6]

The material for filling a bone defect of any one of the claims 1 to 5, wherein the poly L lactic acid polymer has a molecular weight of 200,000 to 250,000.

[Claim 7]

The material for filling a bone defect of any one of the claims 1 to 6, wherein the material for filling a bone defect is subjected to sterilization treatment by being irradiated with γ rays with a dose of 25 kGy to 35 kGy, whereby the molecular weight of the poly L lactic acid reduces to 70,000 to 120,000.

[Claim 8]

The material for filling a bone defect of any one of the claims 1 to 7, wherein the biodegradable fibers has an outer diameter of 10 to 50 μ m.

[Claim 9]

The material for filling a bone defect described in any one of claims 1 to 8, wherein the calcium phosphate particles and the silicon-releasing calcium carbonate particles are dispersed almost homogeneously in the polylactic acid polymer.

[Claim 10]

A method of producing a material for filling a bone defect, comprising the steps of:

providing calcium phosphate particles and SiV particles into a melted poly L lactic acid such that

weight ratio of the three components is 40% to 60% by weight of calcium phosphate, 10% by weight or more of silicon-releasing calcium carbonate, and 30% by weight or more of poly L lactic acid in the remainder and kneading the components by using a kneader in that state;

cooling and solidifying the kneaded solution to produce a composite, wherein molecular weight of poly L lactic acid is 200,000 to 250,000 and an amount of an amorphous phase of the composite is 75% to 98%;

producing a spinning solution by dissolving the composite by using a solvent;

producing a biodegradable fiber by spinning the spinning solution by using an electrospinning method; and

producing a cotton-like structure material for filling a bone defect by receiving the biodegradable fibers in a collector filled with an ethanol liquid and depositing the fiber therein.

[Claim 11]

The method of producing a material for filing a bone defect of claim 1, wherein, an amount of an amorphous phase of the poly-L-lactic acid polymer is 85% to 95%.

[Claim 12]

The method of producing a material for filing a bone defect of claims 1 or 2, wherein the calcium phosphate is β -TCP.

[Claim 13]

The method of producing a material for filing a bone defect of claims 10 to 12, further comprising a

step of decreasing the molecular weight of the poly L lactic acid to 70,000 to 120,000 by performing sterilization treatment to the material for filing a bone defect by irradiation of γ rays with a dose of 25 kGy to 35 kGy.