The hydraulic composition according to Item 15 or 16, which is a cement hydration product.

[0028]

Item 18.

A method for producing the hydraulic composition of any one of Items 15 to 17, comprising mixing a hydraulic powder material and the additive for a hydraulic composition.

[0029]

Item 19.

The production method according to Item 18, wherein in the mixing step, a chemical admixture for concrete is further mixed.

[0029a]

In one aspect, there is provided an additive for a hydraulic composition, comprising flaky carbon and an organic compound containing a hydrophilic group and a hydrophobic group with a high affinity for carbon,

wherein the organic compound is:

an organic compound of which the hydrophilic group comprises at least one member selected from the group consisting of an alcoholic hydroxyl group, $-SO_3Na$, -COONa, $-COOCH_3$, and a polyoxyethylene group, and the hydrophobic group comprises at least one member selected from the group consisting of a hydroxyphenyl group, a methoxyphenyl group, a 3-hydroxypropylphenyl group, a naphthyl group, a hydroxynaphthyl group, an anthracenyl group, a hydroxyanthracenyl group, a tetracenyl group, a hydroxytetracenyl group, a phenanthrenyl group, a hydroxyphenanthrenyl group, a biphenyl group, a hydroxybiphenyl group, a terphenyl group, a fluorenyl group, a hydroxyfluorenyl group, an acenaphthenyl group, an acenaphthylenyl group, a pyrenyl group, a chrysenyl group, a triphenylenyl group, a polyoxypropylene group with a degree of polymerization of 4 or more, and a polyoxybutylene group with a degree of polymerization of 3 or more;

carboxymethylcellulose sodium salt; or

air-entraining and water-reducing admixtures, wherein the air-entraining and water-reducing admixtures are ligninsulfonic acid compounds.

[0029b]

In another aspect, there is provided a method for producing the additive for a hydraulic composition as defined herein, comprising subjecting at least one carbonaceous material dispersion that contains a carbonaceous material having a layered structure, the organic compound containing a hydrophobic group with a high affinity for carbon and a hydrophilic group, and a solvent to pressure treatment at 30 MPa or more,

wherein at least one treatment selected from the group consisting of the following (i) to (iii) is performed by the pressure treatment:

(i) two or more carbonaceous material dispersions that are the at least one carbonaceous material dispersion are collided with each other;

(ii) the carbonaceous material dispersion is collided with a metal or a ceramic material; and

(iii) the carbonaceous material dispersion is passed through a space with a cross-sectional area of 1 cm^2 or less,

the solvent comprises water, and

the content of the water is 70 mass% or more of the solvent.

[0029c]

In another aspect, there is provided a method for producing the additive for a hydraulic composition as defined herein, comprising:

placing a composition that contains a carbonaceous material having a layered structure, the organic compound containing a hydrophobic group with a high affinity for carbon and a hydrophilic group, and a solvent between a rotary plate configured to rotate and a plate disposed substantially parallel to the rotary plate; and

applying shear to the carbonaceous material in the

composition while adjusting the shortest distance between the rotary plate and the plate to 200 μm or less,

wherein the solvent comprises water, and

the content of the water is 70 mass% or more of the solvent.

[0029d]

In another aspect, there is provided a hydraulic composition comprising the additive for a hydraulic composition as defined herein and a hydraulic component.

[0029e]

In another aspect, there is provided a method for producing the hydraulic composition as defined herein, comprising mixing a hydraulic powder material and the additive for a hydraulic composition.

Advantageous Effects of Invention

[0030]

The present invention provides an additive capable of efficiently improving the strength of a hydraulic composition. In the present invention, the strength of a hydraulic composition can be improved by a method that has a production efficiency that is about 10000 times the production efficiency of NPL 1 (100% of the total amount used, compared with a yield of 0.01%) when the concentration of graphite added is 5 mass% and can be easily scaled up with no loss of graphite.

Brief Description of Drawings

[0031]

Fig. 1 is a diagram illustrating the configuration of an additive for a hydraulic composition of the present invention in which the content of an organic compound containing a hydrophilic group and a hydrophobic group with a high affinity for carbon is small (in which the surface of flaky carbon is covered with the organic compound containing a hydrophilic group and a hydrophobic group with a high affinity for carbon).

Fig. 2 is a diagram illustrating the configuration of an additive for a hydraulic composition of the present invention

CLAIMS

[Claim 1]

An additive for a hydraulic composition, comprising flaky carbon and an organic compound containing a hydrophilic group and a hydrophobic group with a high affinity for carbon,

wherein the organic compound is:

an organic compound of which the hydrophilic group comprises at least one member selected from the group consisting of an alcoholic hydroxyl group, $-SO_3Na$, -COONa, $-COOCH_3$, and a polyoxyethylene group, and the hydrophobic group comprises at least one member selected from the group consisting of a hydroxyphenyl group, a methoxyphenyl group, a 3-hydroxypropylphenyl group, a naphthyl group, a hydroxynaphthyl group, an anthracenyl group, a hydroxyanthracenyl group, a tetracenyl group, a hydroxytetracenyl group, a phenanthrenyl group, a hydroxyphenanthrenyl group, a biphenyl group, a hydroxybiphenyl group, a terphenyl group, a fluorenyl group, a hydroxyfluorenyl group, an acenaphthenyl group, an acenaphthylenyl group, a pyrenyl group, a chrysenyl group, a triphenylenyl group, a polyoxypropylene group with a degree of polymerization of 4 or more, and a polyoxybutylene group with a degree of polymerization of 3 or more;

carboxymethylcellulose sodium salt; or

air-entraining and water-reducing admixtures, wherein the air-entraining and water-reducing admixtures are ligninsulfonic acid compounds.

[Claim 2]

The additive for a hydraulic composition according to claim 1, further comprising water.

[Claim 3]

The additive for a hydraulic composition according to claim 1 or 2, wherein the flaky carbon has a carbon content of 95.0 mass% or more.

[Claim 4]

The additive for a hydraulic composition according to any one of claims 1 to 3, wherein the flaky carbon has a size of 0.1 to 30.0 μm.

[Claim 5]

The additive for a hydraulic composition according to any one of claims 1 to 4, wherein the flaky carbon has a thickness of 0.335 to 100 nm.

[Claim 6]

The additive for a hydraulic composition according to any one of claims 1 to 5, wherein the additive for a hydraulic composition comprises the organic compound containing a hydrophilic group and a hydrophobic group with a high affinity for carbon in an amount of 1 to 1000 parts by mass per 100 parts by mass of the flaky carbon.

[Claim 7]

A method for producing the additive for a hydraulic composition of any one of claims 1 to 6, comprising subjecting at least one carbonaceous material dispersion that contains a carbonaceous material having a layered structure, the organic compound containing a hydrophobic group with a high affinity for carbon and a hydrophilic group, and a solvent to pressure treatment at 30 MPa or more,

wherein at least one treatment selected from the group consisting of the following (i) to (iii) is performed by the pressure treatment:

(i) two or more carbonaceous material dispersions that are the at least one carbonaceous material dispersion are collided with each other;

(ii) the carbonaceous material dispersion is collided with a metal or a ceramic material; and

(iii) the carbonaceous material dispersion is passed through a space with a cross-sectional area of 1 cm^2 or less,

the solvent comprises water, and

the content of the water is 70 mass% or more of the

solvent.

[Claim 8]

A method for producing the additive for a hydraulic composition of any one of claims 1 to 6, comprising:

placing a composition that contains a carbonaceous material having a layered structure, the organic compound containing a hydrophobic group with a high affinity for carbon and a hydrophilic group, and a solvent between a rotary plate configured to rotate and a plate disposed substantially parallel to the rotary plate; and

applying shear to the carbonaceous material in the composition while adjusting the shortest distance between the rotary plate and the plate to 200 μm or less,

wherein the solvent comprises water, and

the content of the water is 70 mass% or more of the solvent.

[Claim 9]

The production method according to claim 7 or 8, wherein part or all of the solvent is removed after the pressure treatment or the shear treatment.

[Claim 10]

A hydraulic composition comprising the additive for a hydraulic composition of any one of claims 1 to 6 and a hydraulic component.

[Claim 11]

The hydraulic composition according to claim 10, wherein the content of the additive for a hydraulic composition is 0.01 to 10 part by mass per 100 parts by mass of the hydraulic component.

[Claim 12]

The hydraulic composition according to claim 10 or 11, which is a cement hydration product.

[Claim 13]

A method for producing the hydraulic composition of any one of claims 10 to 12, comprising mixing a hydraulic powder material and the additive for a hydraulic composition.

[Claim 14]

The production method according to claim 13, wherein in the mixing step, a chemical admixture for concrete is further mixed.