space with a cross-sectional area of 1 cm^2 or less. Alternatively, the additive for a hydraulic composition of the present invention can be produced by placing a composition that contains a carbonaceous material having a layered structure, a water-soluble compound containing a hydrophobic group with a high affinity for carbon and a hydrophilic group, and the 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 ~~50~~ 200 μm or less.

[0115]

(2-1) Dispersion (Flaky Carbon Dispersion)

In the dispersion (flaky carbon dispersion) that contains flaky carbon, an organic compound containing a hydrophilic group and a hydrophobic group with a high affinity for carbon, and a solvent, the flaky carbon and the organic compound containing a hydrophilic group and a hydrophobic group with a high affinity for carbon may be as described above. The flaky carbon dispersion may contain one or more other components described above, if necessary.

[0116]

The flaky carbon dispersion may be formed as a dispersion liquid or may be formed as a coating film on a substrate. In this case, as a solvent used to prepare the flaky carbon dispersion (flaky carbon dispersion liquid or flaky carbon coating film), it is preferable to use water as a main solvent from the viewpoint of, for example, the dispersibility of the flaky carbon and the properties of improving the strength of a hydraulic composition.

[0117]

The content of the water in the solvent used is not particularly limited, and is preferably 70 mass% or more (70 to 100 mass%), and more preferably 75 to 100 mass%, based on the total amount of the solvent taken as 100 mass%, from the

CLAIMS

[Claim 1]

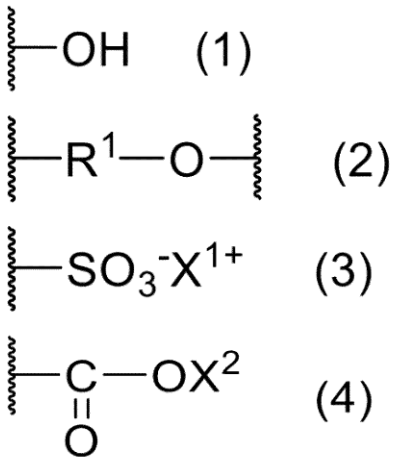
An additive for a hydraulic composition, comprising flaky carbon and an organic compound containing a hydrophilic group and a hydrophobic group with a high affinity for carbon.

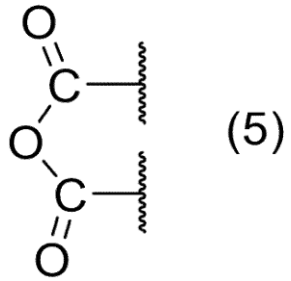
[Claim 2]

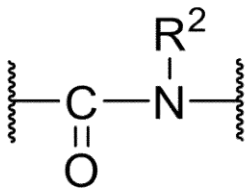
The additive for a hydraulic composition according to claim 1, further comprising water.

[Claim 3]

The additive for a hydraulic composition according to claim 1 or 2, wherein the hydrophilic group comprises at least one member selected from the group consisting of groups represented by formulas (1) to (6):







wherein -OH in formula (1) represents a hydroxyl group; the oxygen atom in formula (2) represents an ether bond; formula (5) represents an acid anhydride group; R^1 represents a divalent organic group; R^2 represents a hydrogen atom or an alkyl group; X^1 represents a hydrogen atom, an alkali metal, NH_4, or organic ammonium; and X^2 represents a hydrogen atom, an alkali metal, NH_4, organic ammonium, or an alkyl group.

[Claim 4]

The additive for a hydraulic composition according to any one of claims 1 to 3, wherein 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.

[Claim 5]

The additive for a hydraulic composition according to any one of claims 1 to 4, wherein the hydrophobic group comprises at least one member selected from the group consisting of an alkyl group, an alkenyl group, a cycloalkyl group, an aryl group, and a polyoxyalkylene group having 3 or more carbon atoms.

[Claim 6]

The additive for a hydraulic composition according to any one of claims 1 to 5, wherein the hydrophobic group comprises an aryl group having at least one oxygen atom attached thereto and/or an aryl group having two or more aromatic rings.

[Claim 7]

The additive for a hydraulic composition according to any one of claims 1 to 6, wherein the organic compound containing a hydrophilic group and a hydrophobic group with a high affinity for carbon is at least one chemical admixture for concrete selected from the group consisting of air-entraining admixtures, water-reducing admixtures, hardening accelerators, air-entraining and water-reducing admixtures, high-range water-reducing admixtures, air-entraining and high-range water-reducing admixtures, and superplasticizers.

[Claim 8]

The additive for a hydraulic composition according to any one of claims 1 to 7, wherein the flaky carbon has a carbon content of 95.0 mass% or more.

[Claim 9]

The additive for a hydraulic composition according to any one of claims 1 to 8, wherein the flaky carbon has a size of 0.1 to 30.0 μm.

[Claim 10]

The additive for a hydraulic composition according to any one of claims 1 to 9, wherein the flaky carbon has a thickness of 0.335 to 100 nm.

[Claim 11]

The additive for a hydraulic composition according to any one of claims 1 to 10, 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 12]

A method for producing the additive for a hydraulic composition of any one of claims 1 to 11, comprising subjecting at least one carbonaceous material dispersion that contains a carbonaceous material having a layered structure, a water-soluble 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 13]
A method for producing the additive for a hydraulic composition of any one of claims 1 to 11, comprising:
placing a composition that contains a carbonaceous material having a layered structure, a water-soluble 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 14]
The production method according to claim 12 or 13, wherein part or all of the solvent is removed after the pressure treatment or the shear treatment.

[Claim 15]
A hydraulic composition comprising the additive for a hydraulic composition of any one of claims 1 to 11 and a hydraulic component.

[Claim 16]

The hydraulic composition according to claim 15, wherein the content of the additive for a hydraulic composition is 0.01 to ~~1~~ 10 part by mass per 100 parts by mass of the hydraulic component.

[Claim 17]

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

[Claim 18]

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

[Claim 19]

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