dispersant for pigment having a solid content of 41.2% and pH of 5.1 was obtained. The ground calcium carbonate was subjected to wet grinding using this neutralized copolymer according to the method described in [2-a]. The dispersion characteristic of the dispersion liquid slurry was evaluated.

[0055]

Example 3

Neutralization was conducted in the same manner as that in Example 1 except that the neutralization rate was set to be 20% with monoethanolamine and 30% with 48% sodium hydroxide aqueous solution. Accordingly, dispersant for pigment having a solid content of 42.1% and pH of 5.0 was obtained. The ground calcium carbonate was subjected to wet grinding using this neutralized copolymer according to the method described in [2-a]. The dispersion characteristic of the dispersion liquid slurry was evaluated.

[0056]

Example 4

Neutralization was conducted in the same manner as that in Example 1 except that the neutralization rate was set to be only 30% with monoethanolamine. Accordingly, dispersant for pigment having a solid content of 42.9% and pH of 4.4 was obtained. The ground calcium carbonate was subjected to wet grinding using this neutralized copolymer according to the method described in [2-a]. The dispersion characteristic of the dispersion liquid slurry was evaluated.

[0057]

~~Example 5~~ Comparative Example 6

Neutralization was conducted in the same manner as that in Example 1 except that the neutralization rate was set to be 30% with monoethanolamine and 50% with 48% sodium hydroxide aqueous solution. Accordingly, dispersant for pigment having a solid content of 41.2% and pH of 5.9 was obtained. The ground calcium carbonate was subjected to wet grinding using this neutralized copolymer according to the method described in [2-a]. The dispersion characteristic of the dispersion liquid slurry was evaluated.

[0058]

~~Example 6~~ Comparative Example 7

Neutralization was conducted in the same manner as that in Example 1 except that the neutralization rate was set to be only 50% with monoethanolamine. Accordingly, dispersant for pigment having a solid content of 43.0% and pH of 5.2 was obtained. The ground calcium carbonate was subjected to wet grinding using this neutralized copolymer according to the method described in [2-a]. The dispersion characteristic of the dispersion liquid slurry was evaluated.

[0059]

~~Example 7~~ Comparative Example 8

Neutralization was conducted in the same manner as that in Example 1 except that the neutralization rate was set to be only 80% with monoethanolamine. Accordingly, dispersant for pigment having a solid content of 43.4% and pH of 5.9 was obtained. The ground calcium carbonate was subjected to wet grinding using this neutralized copolymer according to the method described in [2-a]. The dispersion characteristic of the dispersion liquid slurry was evaluated.

[0060]

~~Example 8~~ Comparative Example 9

Neutralization was conducted in the same manner as that in Example 1 except that the neutralization rate was set to be only 50% with ammonia. Accordingly, dispersant for pigment having a solid content of 40% and pH of 4.9 was obtained. The ground calcium carbonate was subjected to wet grinding using this neutralized copolymer according to the method described in [2-a]. The dispersion characteristic of the dispersion liquid slurry was evaluated.

[0061]

Example ~~9~~5

Neutralization was conducted in the same manner as that in Example 1 except using the (meth)acrylic acid-based copolymer A-1 instead of the (meth)acrylic acid-based copolymer B-1 used in Example 1. Accordingly, dispersant for pigment having a solid content of 42.3% and pH of 5.1 was obtained. The ground calcium carbonate was subjected to wet grinding using this neutralized copolymer according to the method described in [2-a]. The dispersion characteristic of the dispersion liquid slurry was

[0068]

Table 1

		Elapsed days (60rpm)		Median size (μm)	Slurry NV (%)	Slurry pH	Slurry fluidity	Slurry filterability
		Immediately after grinding	After 1 week					
Example 1	B-1	610	930	0.604	75.0	1	1	1
Example 2	B-2	700	930	0.603	75.0	1	1	1
Example 3	B-1	510	850	0.588	75.0	1	1	1
Example 4	B-1	720	990	0.630	75.0	1	1	1
Example 5	B-1	730	2700	0.589	75.1	1	2	1
Example 6	B-1	820	1640	0.618	75.1	1	1	1
Example 7	B-1	700	2700	0.599	75.1	1	2	1
Example 8	B-1	560	1350	0.598	75.0	1	1	1
Example 9	A-1	970	1340	0.635	75.2	1	1	2

[0068]

Table 1

		Elapsed days (60rpm)		Median size (μm)	Slurry NV (%)	Slurry pH	Slurry fluidity	Slurry filterability
		Immediately after grinding	After 1 week					
Example 1	B-1	610	930	0.604	75.0	1	1	1
Example 2	B-2	700	930	0.603	75.0	1	1	1
Example 3	8-1	510	850	0.588	75.0	1	1	1
Example 4	B-1	720	990	0.630	75.0	1	1	1
Comparative Example 6	B-1	730	2700	0.589	75.1	1	2	1
Comparative Example 7	B-1	820	1640	0.618	75.1	1	1	1
Comparative Example 8	B-1	700	2700	0.599	75.1	1	2	1
Comparative Example 9	B-1	560	1350	0.598	75.0	1	1	1
Example 5	A-1	970	1340	0.635	75.2	1	1	2

What is claimed is:

1. A dispersant for calcium carbonate having pH of 6.0 or lower, characterized in that said dispersant is partially neutralized product of (A) polymer of (a) α,β-unsaturated carboxylic acid or (B) copolymer consisting of 80% to 99% by mole of a unit derived from (a) α,β-unsaturated carboxylic acid and 1% to 20% by mole of at least one unit selected from the group consisting of a unit derived from (b) (meth)acrylic acid ester and a unit derived from (c) (meth)acrylic acid ester of polyalkylene glycol, based on 100% by mole of the total of (a), (b) and (c), that 20% to 80% by mole of the acid group is partially neutralized with ammonia or organic amine, and that said polymer (A) or said polymer (B) is neutralized so that 20% to 80% by mole of the carboxyl groups derived from said α,β-unsaturated carboxylic acid (a) is converted into free acid group.

2. The dispersant for calcium carbonate according to Claim 1, wherein 20% to 50% by mole of the acid group in said polymer (A) or said copolymer (B) is partially neutralized with ammonia or organic amine, and wherein said polymer (A) or said copolymer (B) is neutralized so that 50% to 70% by mole of the carboxyl groups derived from said α,β-unsaturated carboxylic acid (a) is converted into free acid group.

3. The dispersant for calcium carbonate according to Claim 1 or 2, wherein said monomer (b) for forming said copolymer (B) is (meth)acrylic acid ester with 1 to 8 carbon atoms, and said monomer (c) is (meth)acrylic acid ester of polyalkylene glycol represented by the following general formula (1):

$$CH_2=C(R^1)-COO-(CH_2)_m-(R^2-O)_n-R^3 \qquad (1)$$

wherein R^1 is hydrogen atom or methyl group, R^2 is ethylene group or propylene group, R^3 is hydrogen atom or alkyl group with 1 to 6 carbon atoms, m is the number of 0 to 4, and n is the number of 2 to 10.

4. The dispersant for calcium carbonate according to any one of Claims 1 to 3, wherein said acid group in said unit derived from said monomer (a) in said polymer (A) or said copolymer (B) is in a form of organic

amine salt.

5. The dispersant for calcium carbonate according to any one of Claims 1 to 4, wherein the weight average molecular weight (Mw) of said polymer (A) or said copolymer (B) is in the range from 4,000 to 8,000 based on polyacrylic acid standard by gel permeation chromatography, and Mw/Mn (weight average molecular weight/number average molecular weight) is 2.7 or less.

6. The dispersant for calcium carbonate according to any one of Claims 1 to 5, wherein said dispersant is of said copolymer (B).

7. The dispersant for calcium carbonate according to any one of Claims 1 to 6, wherein said monomer (a) for forming said copolymer (B) is acrylic acid, said monomer (b) is butyl acrylate, and said monomer (c) is polypropylene glycol mono (meth)acrylate where R^2 in said general formula (1) is propylene group.

8. The dispersant for calcium carbonate according to any one of Claims 1 to 7, wherein said organic amine is monoethanol amine.

9. A dispersion of calcium carbonate having pH of 9.5 or higher, which is prepared by wet grinding using said dispersant for calcium carbonate according to any one of Claims 1 to 8 by wet grinding.

10. The dispersion of calcium carbonate according to Claim 9, wherein said calcium carbonate is ground calcium carbonate.

What is claimed is:

1. A dispersant for calcium carbonate having pH of 6.0 or lower, characterized in that said dispersant is a partially neutralized product of (A) polymer of (a) α,β-unsaturated carboxylic acid or (B) copolymer consisting of 80% to 99% by mole of a unit derived from (a) α,β-unsaturated carboxylic acid and 1% to 20% by mole of at least one unit selected from the group consisting of a unit derived from (b) (meth)acrylic acid ester and a unit derived from (c) (meth)acrylic acid ester of polyalkylene glycol, based on 100% by mole of the total of (a), (b) and (c),

that said monomer (a) is at least one compound selected from the group consisting of (meth)acrylic acid, maleic acid, fumaric acid, itaconic acid, crotonic acid and citraconic acid,

that said monomer (b) is a (meth)acrylic acid alkyl ester having 1 to 8 carbon atoms,

that said monomer (c) is a (meth)acrylic acid ester of a polyalkylene glycol represented by the following general formula (1):

$$CH_2=C(R^1)-COO-(CH_2)_m-(R^2-O)_n-R^3 \qquad (1)$$

wherein R^1 is hydrogen atom or methyl group, R^2 is ethylene group or propylene group, R^3 is hydrogen atom or alkyl group with 1 to 6 carbon atoms, m is the number of 0 to 4, and n is the number of 2 to 10,

that said partially neutralized product is one in which 20% to 30% by mole of carboxyl group in said monomer (a) forming said polymer (A) or said copolymer (B) is neutralized by ammonia, a lower alkylamine having alkyl group with 1 to 20 carbon atoms, or an alkanolamine, and

that said partially neutralized product has a carboxyl group in an amount from 50% to 70% by mole, derived from said monomer (a) forming said polymer (A) or said copolymer (B).

2. The dispersant for calcium carbonate according to Claim 1, wherein said partially neutralized product is one in which 20% to 30% by mole of carboxyl group in said monomer (a) forming said polymer (A) or said copolymer (B) is neutralized by a lower alkylamine having alkyl group with 1 to 20 carbon atoms, or an alkanolamine.

3. The dispersant for calcium carbonate according to any one of Claim 1 or 2, wherein the weight average molecular weight (Mw) of said polymer (A) or said copolymer (B) is in the range from 4,000 to 8,000 based on polyacrylic acid standard by gel permeation chromatography, and Mw/Mn (weight average molecular weight/number average molecular weight) is 2.7 or less.

4. The dispersant for calcium carbonate according to any one of Claims 1 to 3, wherein said dispersant is of said copolymer (B).

5. The dispersant for calcium carbonate according to any one of Claims 1 to 4, wherein said monomer (a) for forming said copolymer (B) is acrylic acid, said monomer (b) is butyl acrylate, and said monomer (c) is polypropylene glycol mono (meth)acrylate where R^2 in said general formula (1) is propylene group.

6. The dispersant for calcium carbonate according to any one of Claims 1 to 5, wherein said partially neutralized product is one in which 20% to 30% by mole of carboxyl group in said monomer (a) forming said polymer (A) or said copolymer (B) is neutralized by monoethanol amine.

7. A dispersion of calcium carbonate having pH of 9.5 or higher, which is prepared by wet grinding using said dispersant for calcium carbonate according to any one of Claims 1 to 6 by wet grinding.

8. The dispersion of calcium carbonate according to Claim 7, wherein said calcium carbonate is ground calcium carbonate.