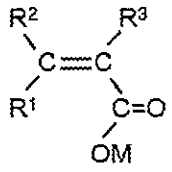
It is claimed:

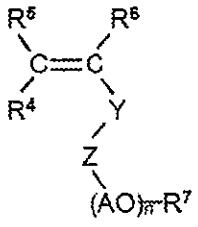
1. A composition for modifying a hydratable cementitious composition, comprising:
three different carboxylate polymers, identified herein as Polymer I, Polymer II, and Polymer III, each of said polymers being obtained from Components A, B, and C in accordance with the component ratios for Polymers I, II, and III as set forth in detail below, wherein:

Component A is an unsaturated carboxylic acid monomer represented by structural formula 1,



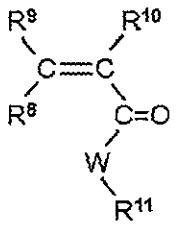
[formula 1],

Component B is a polyoxyalkylene monomer represented by structural formula 2:



[formula 2];

Component C is an unsaturated carboxylate ester or amide monomer represented by structural formula 3:



[formula 3];

wherein

R^1, R^2, R^3, R^4, R^5, R^6, R^7, R^8, R^9, and R^{10} each individually represent a hydrogen atom, a C_1 to C_4 alkyl group, or --COOM group wherein M represents a hydrogen atom or an alkali metal;

Y represents $--(CH_2)_p--$ wherein "p" represents an integer of 0 to 6;

Z represents --O--, --COO--, --OCO--, --COHN--, or --NHCO--;

-$(AO)_n$ represents linear repeating ethylene oxide groups, propylene oxide groups, butylene oxide groups, or a mixture thereof;

"n" represents the average number of repeating -(AO) groups and is an integer of from 10 to 250;

W represents an oxygen atom or an --NH-- group, and

R^{11} represents a C_1-C_{10} alkyl group or a C_2-C_{10} hydroxyalkyl group;

wherein, in Polymer I, the Components A, B, and C are present in a molar ratio (A:B:C) in the range of 2:1:0 to 5:1:0;

and further wherein, in Polymer II, the Components A, B, and C are present in a molar ratio (A:B:C) in the range of 0.1:1:0 to 2:1:0; and

further wherein, in Polymer III, the molar ratio of Component A to the sum of Components B and C is in the range (A:B+C) of 0.3:1 to 3:1.

2. The composition of claim 1 wherein, in Polymer I, the molar ratio of Component A to Component B is in the range (A:B) of 2:1 to 5:1.

3. The composition of claim 1 wherein, in Polymer I, the molar ratio of Component A to Component B is in the range (A:B) of 2.3:1 to 4.5:1.

4. The composition of claim 1 wherein, in Polymer I, the molar ratio of Component A to Component B is in the range (A:B) of 2.5:1 to 4.0:1.

5. The composition of claim 1 wherein, in Polymer II, the molar ratio of Component A to Component B is in the range (A:B) of 0.1:1 to 2:1.

6. The composition of claim 1 wherein, in Polymer II, the molar ratio of Component A to Component B is in the range (A:B) of 0.6:1 to 1.7:1.

7. The composition of claim 1 wherein, in Polymer III, the molar ratio of Component A to the sum of Components B and C is in the range (A:B+C) of 0.3:1 to 3:1.

8. The composition of claim 1 wherein, in Polymer III, the molar ratio of Component A to the sum of Components B and C is in the range (A:B+C) of 0.4:1 to 2:1.

9. The composition of claim 1 wherein, in Polymer III, the molar ratio of Component A to the sum of Components B and C is in the range (A:B+C) of 0.5:1 to 1:1.

10. The composition of claim 1 wherein the weight-average molecular weight of Polymers I, II, and III is between 10,000 and 300,000.

11. The composition of claim 1 wherein the weight-average molecular weight of Polymers I, II, and III is between 20,000 and 200,000.

12. The composition of claim 1 wherein Component A comprises an acrylic acid, methacrylic acid, maleic acid, C_1-C_4 alkyl maleic monoester, maleic monoamide, N--(C_1-C_4) alkyl maleic monoamide, fumaric acid, C_1-C_4 alkyl fumaric monoester, N--(C_1-C_4) alkyl fumaric monoamide, crotonic acid, itaconic acid, or a mixture thereof.

13. The composition of claim 1 wherein Component B comprises a poly(alkylene glycol)methyl ether acrylate, poly(alkylene glycol)ethyl ether acrylate, poly(alkylene glycol)methyl ether methacrylate, poly(alkylene glycol)ethyl ether methacrylate, poly(alkylene glycol)methyl ether maleate monoester, poly(alkylene glycol)methyl ether fumarate monoester, N-poly(alkylene glycol) acrylamide, N-poly(alkylene glycol) methacrylamide, poly(alkylene glycol) vinyl ether, poly(alkylene glycol) allyl ether, poly(alkylene glycol) methallyl ether, poly(alkylene glycol) isoprenyl ether, poly(alkylene glycol) vinyloxybutylene ether, or mixture thereof; and further wherein the nominal molecular weight of the polyalkylene glycol is in the range of 450 to 11,000.

14. The composition of claim 13 wherein the nominal molecular weight of the polyalkylene glycol is in the range of 1,000 to 8,000.

15. The composition of claim 1 wherein Component C comprises an alkyl (meth)acrylate, a hydroxyalkyl (meth)acrylate, (meth)acrylamide or derivative thereof, an alkyl maleic diester, a hydroxyalkyl maleic diester, or a mixture thereof.

16. The composition of claim 1 further comprising at least one conventional concrete admixture selected from the group consisting of water reducer, accelerator, retarder, strength enhancing agent, air detraining agent, air entraining agent, shrinkage reducing admixture, or a mixture thereof.

17. The composition of claim 16 wherein the composition further comprises a water reducer selected from the group consisting of lignosulfonates, naphthalene sulfonate formaldehyde condensates, melamine sulfonate formaldehyde condensates, gluconic acid or gluconate, corn syrup, or a mixture thereof.

18. The composition of claim 16 wherein the composition further comprises a strength enhancer.

19. The composition of claim 18 wherein the strength enhancer is an alkanolamine.

20. A cementitious composition comprising a cementitious binder and the composition of claim 1.