Claims

1. A system for achieving and monitoring fast response time of chemical fluidizing admixture in a hydratable concrete mix, comprising:

a rotatable mixer drum for containing a hydratable concrete mix;

a system for continuous monitoring of slump of the hydratable concrete mix contained in the rotatable mixer drum and for dispensing controlled amounts of fluidizing chemical admixture into the concrete mix within the drum based on the continuous monitoring; and

a fluidizing chemical admixture to be dispensed by the system into the hydratable concrete mix contained in the rotatable mixer drum, the admixture comprising at least one comb-type polycarboxylate ether polymer for modifying slump of the concrete mix (the one or more comb-type polycarboxylate ether polymer or polymers being hereinafter referred to as "PCE"), the PCE having a cumulative adsorptivity coefficient (A_c) of 40%-75% as determined by a depletion method whereby a sample of the PCE is charged into an aqueous cement slurry containing the cement used for making the hydratable concrete mix, the aqueous cement slurry being separated after 120 seconds mixing of the PCE-containing aqueous cement slurry to obtain supernatant pore water, in accordance with the formula

$$A_c = [(A - B)/A] \times 100$$

wherein

A represents the total amount of PCE added to the aqueous cement slurry before separation to obtain the supernatant pore water,

B represents the amount of the PCE remaining in the supernatant pore water obtained by separation from the aqueous cement slurry after 120 seconds mixing, and wherein adsorptivity is measured at 25° Celcius on the supernatant pore water separated from the aqueous cement slurry after 120 seconds mixing of the aqueous cementitious slurry containing the cement, water, and PCE, wherein water/cement ratio of the slurry is 0.4 and the amount of the PCE dosed into the aqueous cementitious slurry is between 0.03%-0.5% by dry weight based on cement and is calculated by mortar test whereby dosage for the PCE is that which would provide the same fluidity as adding 14% additional water into the aqueous cementitious slurry; and wherein

the slump monitoring system is programmed to monitor on a continuous basis and to adjust slump by introducing fluidizing chemical admixture containing the PCE having the cumulative adsorptivity coefficient (A_c) into the concrete load and performing monitoring and adjustment

steps in iterative fashion during transit or after arrival at the delivery site where the concrete mix is poured into place.

2. The system of claim 1 wherein the cumulative adsorption coefficient of the PCE is 50%-60%.

3. The system of claim 1 wherein at least two PCE polymers are admixed into the concrete mix.

4. The system of claim 3 wherein at least one of said PCE polymers has an individual adsorptivity coefficient that is greater than 75%.

5. The system of claim 3 wherein at least one of said PCE polymers has an individual adsorptivity coefficient that is less than 40%.

6. The system of claim 1 wherein at least three PCE polymers are admixed into the concrete mix, and wherein at least two of the three PCE polymers has an individual adsorptivity coefficient that is greater than 75%.

7. The system of claim 1 wherein at least three PCE polymers are admixed into the concrete mix, and wherein at least two of the three PCE polymers has an individual adsorptivity coefficient that is less than 40%.

8. Method for achieving fast response time of a polycarboxylate ether polymer in a concrete mix, comprising:

providing a rotatable mixer drum for containing a hydratable concrete mix;

providing a system for continuous monitoring of slump of the hydratable concrete mix contained in the rotatable mixer drum and for dispensing controlled amounts of fluidizing chemical admixture into the concrete mix within the drum based on the continuous monitoring; and

providing a fluidizing chemical admixture to be dispensed by the system, the admixture comprising at least one comb-type polycarboxylate ether polymer for modifying slump of the concrete mix (the one or more comb-type polycarboxylate ether polymer or polymers being hereinafter referred to as "PCE"), the PCE having a cumulative adsorptivity coefficient (A_c) of 40%-75% as determined by a depletion method whereby a sample of the PCE is charged into an aqueous cement slurry containing the cement used for making the hydratable concrete mix, and mixed together and separated after 120 seconds continuous mixing of the aqueous cement slurry to obtain supernatant pore water, in accordance with the formula

$$A_c = [(A - B)/A] \times 100$$

wherein

A represents the total amount of PCE added to the aqueous cement slurry which was then separated to obtain the supernatant pore water,

B represents the amount of the PCE remaining in the supernatant pore water obtained by separation from the aqueous cement slurry, and

wherein adsorptivity is measured at 25° Celcius on the supernatant pore water separated from the aqueous cement slurry after 120 seconds continuous mixing of the aqueous cementitious slurry containing the cement, water, and PCE, wherein water/cement ratio of the slurry is 0.4 and the amount of the PCE dosed into the aqueous cementitious slurry is between 0.03%-0.5% by dry weight based on cement and
PCE dosage used is calculated by mortar test whereby dosage for the PCE is that which would provide the same fluidity as adding 14% additional water into the aqueous cementitious slurry; and further wherein

the slump monitoring system is programmed to monitor on a continuous basis and to adjust slump by introducing fluidizing chemical admixture containing the PCE having the cumulative adsorptivity coefficient (A_c) into the concrete load and performing monitoring and adjustment steps in iterative fashion during transit or after arrival at the delivery site where the concrete mix is poured into place.

9. The method of claim 8 further comprising dosing the admixture into the concrete mixer drum containing the hydratable concrete mix.

10. The system of claim 1 wherein the system for continuous monitoring of slump of the hydratable concrete mix contained in the rotatable mixer drum and for dispensing controlled amounts of fluidizing chemical admixture into the concrete mix within the drum based on the continuous monitoring, comprises a sensor selected from the group consisting of hydraulic pressure sensor, electromechanical sensor, or combination thereof.

11. The system of claim 8 wherein the system for continuous monitoring of slump of the hydratable concrete mix contained in the rotatable mixer drum and for dispensing controlled amounts of fluidizing chemical admixture into the concrete mix within the drum based on the continuous monitoring, comprises a sensor selected from the group consisting of hydraulic pressure sensor, electromechanical sensor, or combination thereof.