CLAIMS

WHAT IS CLAIMED IS:

1. A method for producing a cement mix comprising mixing water, cement, carbon dioxide, an admixture, and, optionally, aggregates, wherein the combination of carbon dioxide and admixture results in a concrete mix with a compressive strength at one or more time points that is greater than the same concrete mix with just admixture, and/or the same concrete mix with just carbon dioxide, wherein

(i) the carbon dioxide is present in an amount of 0.05-1% by weight cement (bwc)

(ii) the admixture comprises polyacrylate, such as sodium polyacrylate; polycarboxylate, such as polycarboxylate ether; lignin, such as a lignin polymer, a lignosulphate, a lignosulfonate triethanolamine; triethanolamine (TEA); a nitrate, such as sodium nitrate; a thiocyanate, such as sodium thiocyanate; or a combination thereof.

2. The method of claim **1** wherein the carbon dioxide is present in an amount of at least 0.01, 0.02, 0.03, 0.04, 0.05, 0.07, 0.1, 0.15, 0.2, 0.25, 0.3, 0.35, 0.4, 0.45, 0.5, 0.6, 0.7, 0.8, 0.9, or 1.0% by weight cement (bwc) and/or not more than 0.02, 0.03, 0.04, 0.05, 0.07, 0.1, 0.15, 0.2, 0.25, 0.3, 0.35, 0.4, 0.45, 0.5, 0.6, 0.7, 0.8, 0.9, 1.0, 2.0, or 5% bwc, in certain embodiments at least 0.1%, such as 0.1-0.5%, preferably 0.1-0.4%; in certain embodiments at least 0.2%, such as 0.2-0.5%, preferably 0.3-0.5%.

3. The method of claim **1** wherein the admixture is present in an amount of at least 0.02, 0.04, 0.06, 0.08, 0.1, 0.15, 0.2, 0.25, 0.3, 0.35, 0.4, 0.45, 0.5, 0.55, 0.6, 0.65, 0.7, 0.75, 0.8, 0.85, 0.9, 0.95, 1.0, 1.2, 1.4, 1.6, 1.8, or 2.0% bwc and/or not more than 0.04, 0.06, 0.08, 0.1, 0.15, 0.2, 0.25, 0.3, 0.35, 0.4, 0.45, 0.5, 0.55, 0.6, 0.65, 0.7, 0.75, 0.8, 0.85, 0.9, 0.95, 1.0, 1.2, 1.4, 1.6, 1.8, 2.0, 3.0, 4.0, or 5% bwc; in certain embodiments 0.05-1%, such as 0.1 to 0.8%.

4. The method of claim **1** wherein the admixture comprises a polycarboxylate or polycarboxylate derivative, e.g., polycarboxylate ether, wherein the polycarboxylate or polycarboxylate derivative is present in an amount from 0.1 to 1% bwc, preferably 0.2 to 1% bwc, even more preferably 0.2 to 0.8%.

5. The method of claim **1** wherein the admixture comprises a lignin or lignin derivative comprising lignosulfate or lignosulfonate, wherein the admixture is present in an amount from 0.2 to 8% bwc, preferably 0.2 to 6% bwc, even more preferably 0.3 to 0.5%.

6. The method of claim **1** wherein the admixture comprises a polyacrylate or polyacrylate derivative, wherein the admixture is present in an amount from 0.02 to 0.3% bwc, preferably 0.04 to 0.2% bwc, even more preferably 0.06 to 0.2%.

7. The method of any of the previous claims wherein the combination of carbon dioxide and admixture results in a concrete mix with a setting time that is within allowable limits, whereas the same concrete mix with just admixture, and/or the same concrete mix with just carbon dioxide results in a concrete mix with a setting time that is not within allowable limits.

8. A composition comprising

(i) a hydraulic cement;

(ii) water;

(iii) carbon dioxide and/or reaction products of carbon dioxide with the hydraulic cement, in an amount from 0.01 to 5% bwc; and

(iv) an admixture in an amount from 0.01 to 2% bwc, wherein

(a) the admixture comprises polyacrylate, such as sodium polyacrylate; polycarboxylate, such as polycarboxylate ether; lignin, such as a lignin polymer, a lignosulphate, a lignosulfonate triethanolamine; triethanolamine (TEA); a nitrate, such as sodium nitrate; a thiocyanate, such as sodium thiocyanate; or a combination thereof.

9. The composition of claim 8 wherein the admixture comprises a polycarboxylate or polycarboxylate derivative such as polycarboxylate ether.

10. The composition of claim 9 wherein the polycarboxylate or polycarboxylate derivative is present in an amount from 0.1 to 1% bwc, preferably 0.2 to 1% bwc, even more preferably 0.2 to 0.8%.

11. The composition of claim 8 wherein the admixture comprises a lignin or lignin derivative such as lignosulfate, lignosulfonate, or a combination thereof.

12. The composition of claim 11 wherein the admixture is present at a concentration of is present in an amount from 0.2 to 8% bwc, preferably 0.2 to 6% bwc, even more preferably 0.3 to 0.5%.

13. The composition of claim 8 wherein the admixture comprises a polyacrylate or polyacrylate derivative.

14. The composition of claim 13 wherein the admixture is present in an amount from 0.02 to 0.3% bwc, preferably 0.04 to 0.2% bwc, even more preferably 0.06 to 0.2%.