Figure 1

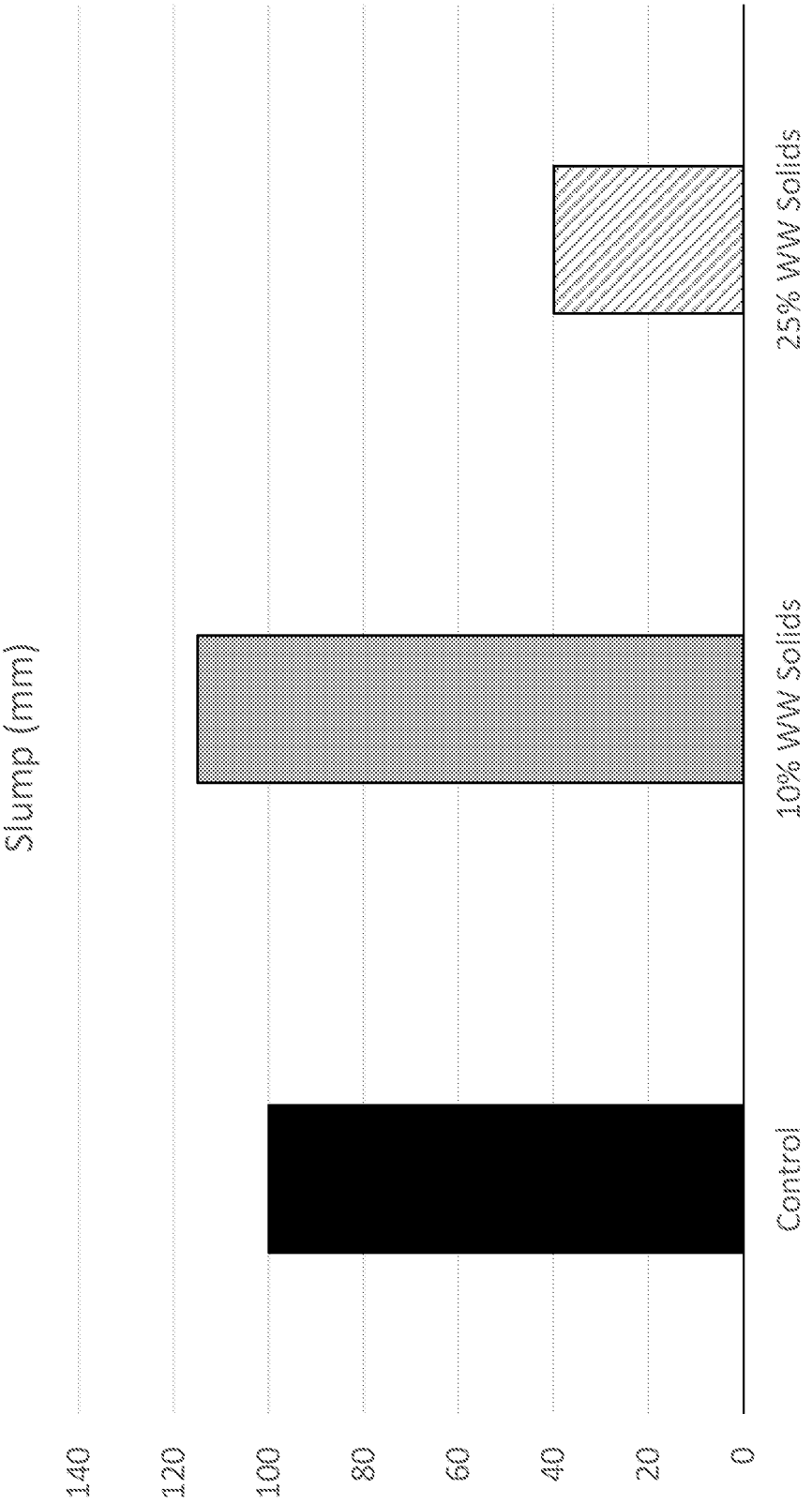

Slump (mm)
140
120
100
80
60
40
20
0
Control
10% WW Solids
25% WW Solids

Figure 2

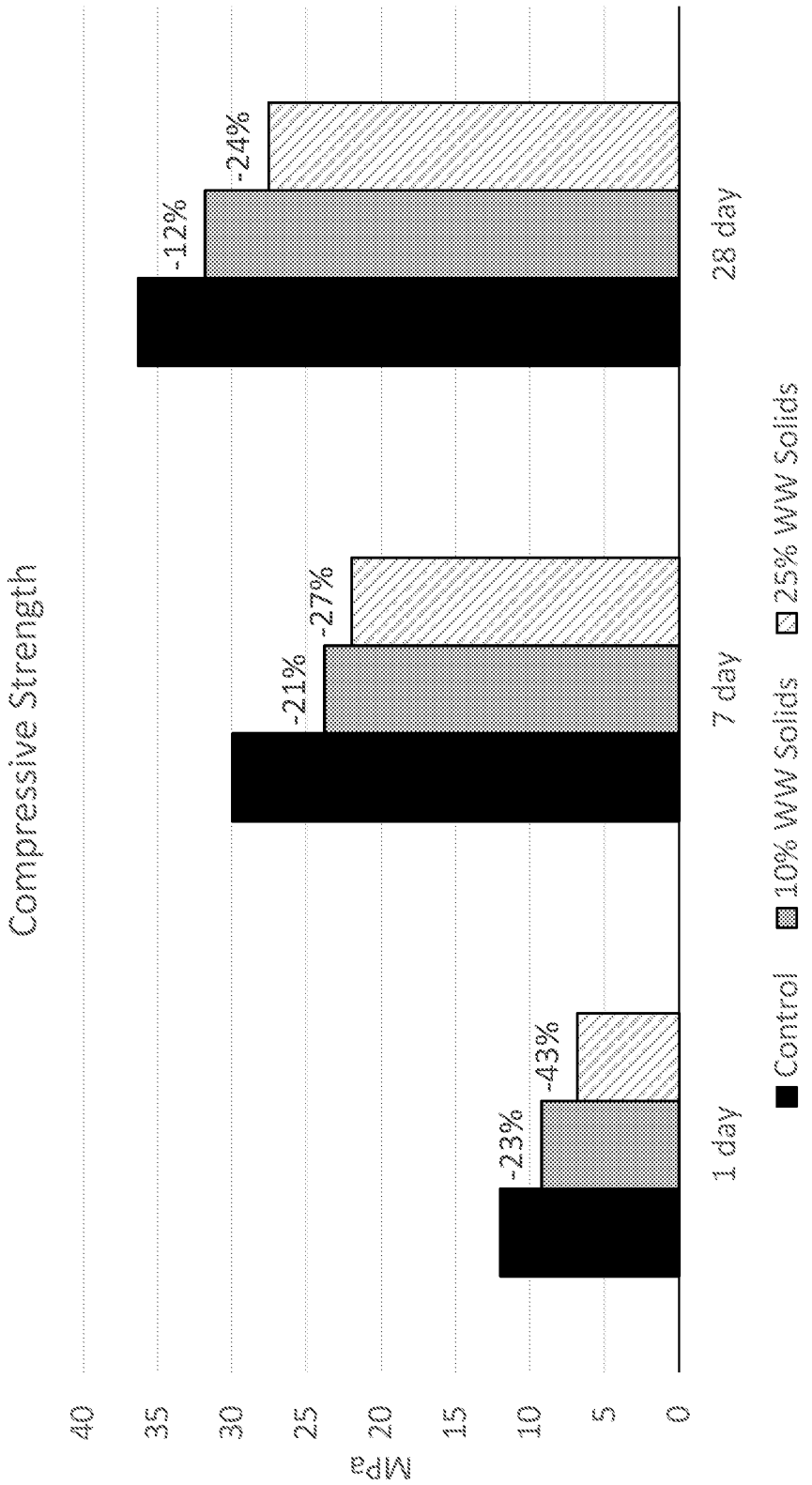

Compressive Strength
MPa
40
35
30
25
20
15
10
5
0
-12%
-24%
-21%
-27%
-23%
-43%
28 day
7 day
1 day
Control
10% WW Solids
25% WW Solids

Figure 3

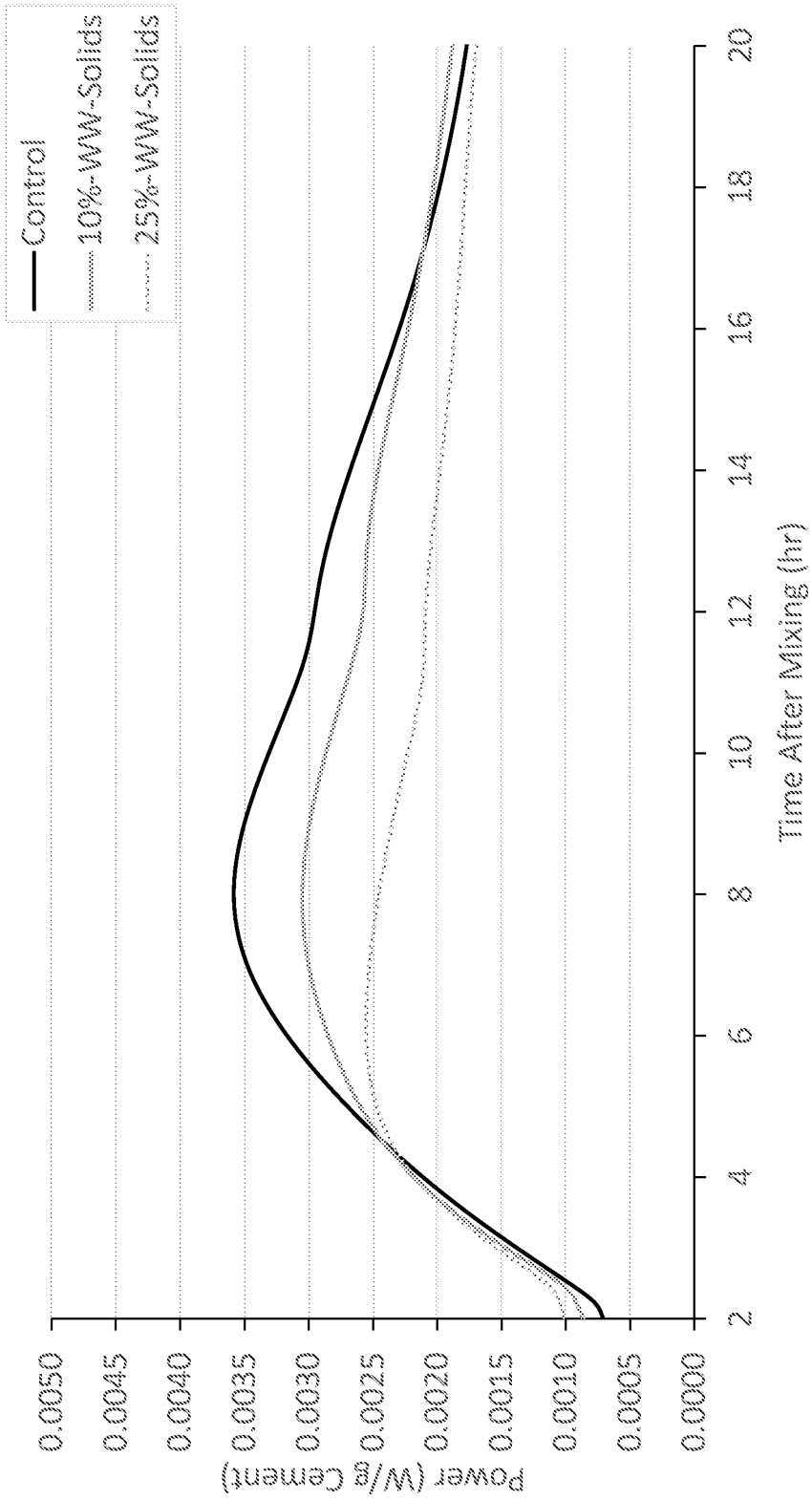

Control
10%-WW-Solids
25%-WW-Solids
Power (W/g Cement)
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
Time After Mixing (hr)
2
4
6
8
10
12
14
16
18
20

Figure 4

| Batch ID | Control | 10% WW Solids | 25% WW Solids |
|---|---|---|---|
| Sand Mass (kg) | 18.99 | 18.99 | 18.99 |
| Coarse Agg Mass (kg) | 26.24 | 26.24 | 26.24 |
| Cement Mass (kg) | 7.50 | 6.75 | 5.63 |
| Cement Type | LBr | LBr | LBr |
| Target batch water (kg) | 4.69 | 4.69 | 4.69 |
| Water Mass (kg) | 4.45 | 4.45 | 4.45 |
| WW Solids Mass (kg) | 0 | 0.75 | 1.88 |
| w/c Ratio | 0.63 | 0.63 | 0.63 |
| Volume ($m^3$) | 0.0242 | 0.0242 | 0.0242 |

LBr = LaFarge Brookfield

Figure 5

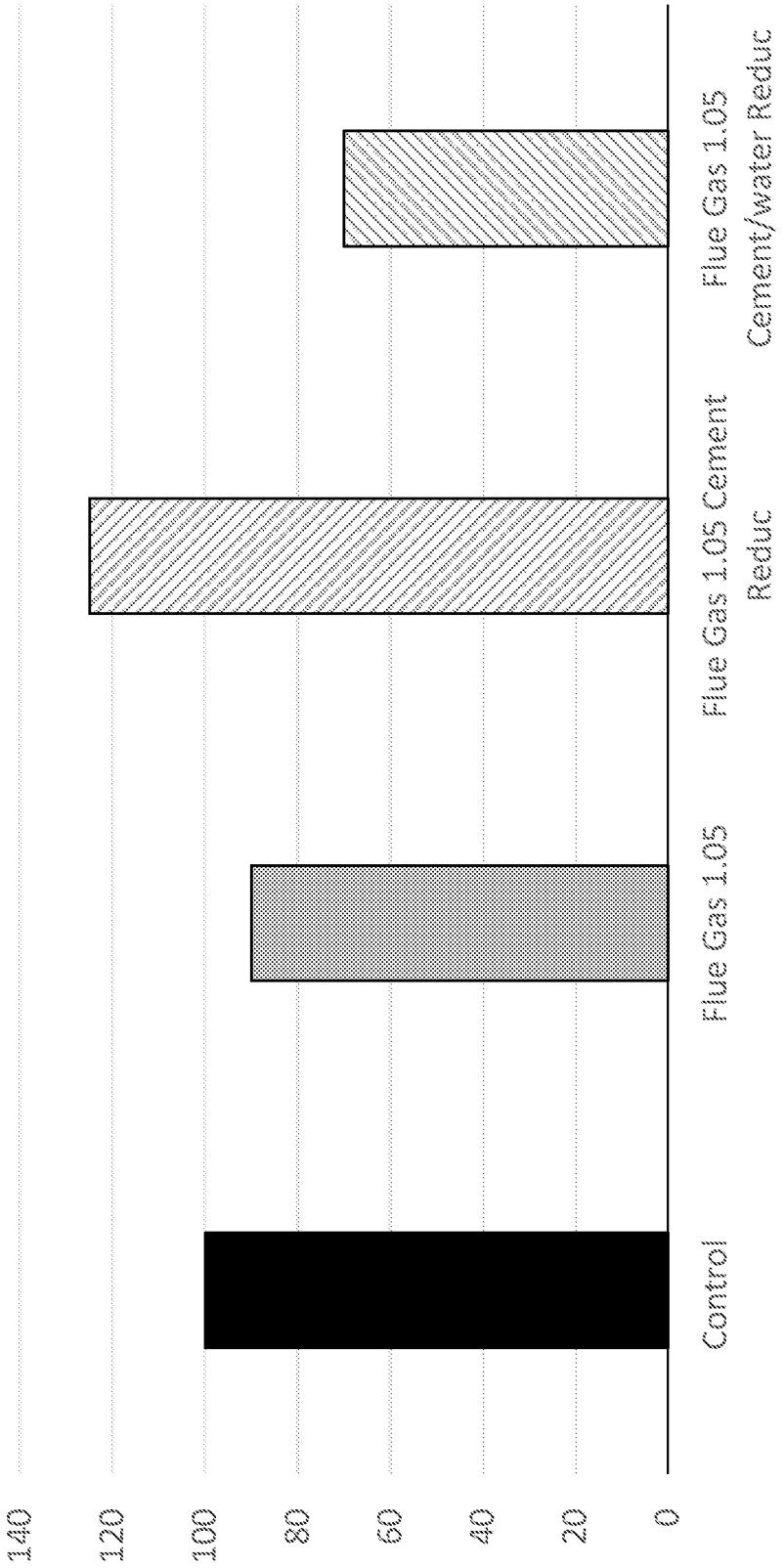

Slump (mm)
140
120
100
80
60
40
20
0
Control
Flue Gas 1.05
Flue Gas 1.05 Cement Reduc
Flue Gas 1.05 Cement/water Reduc

Figure 6

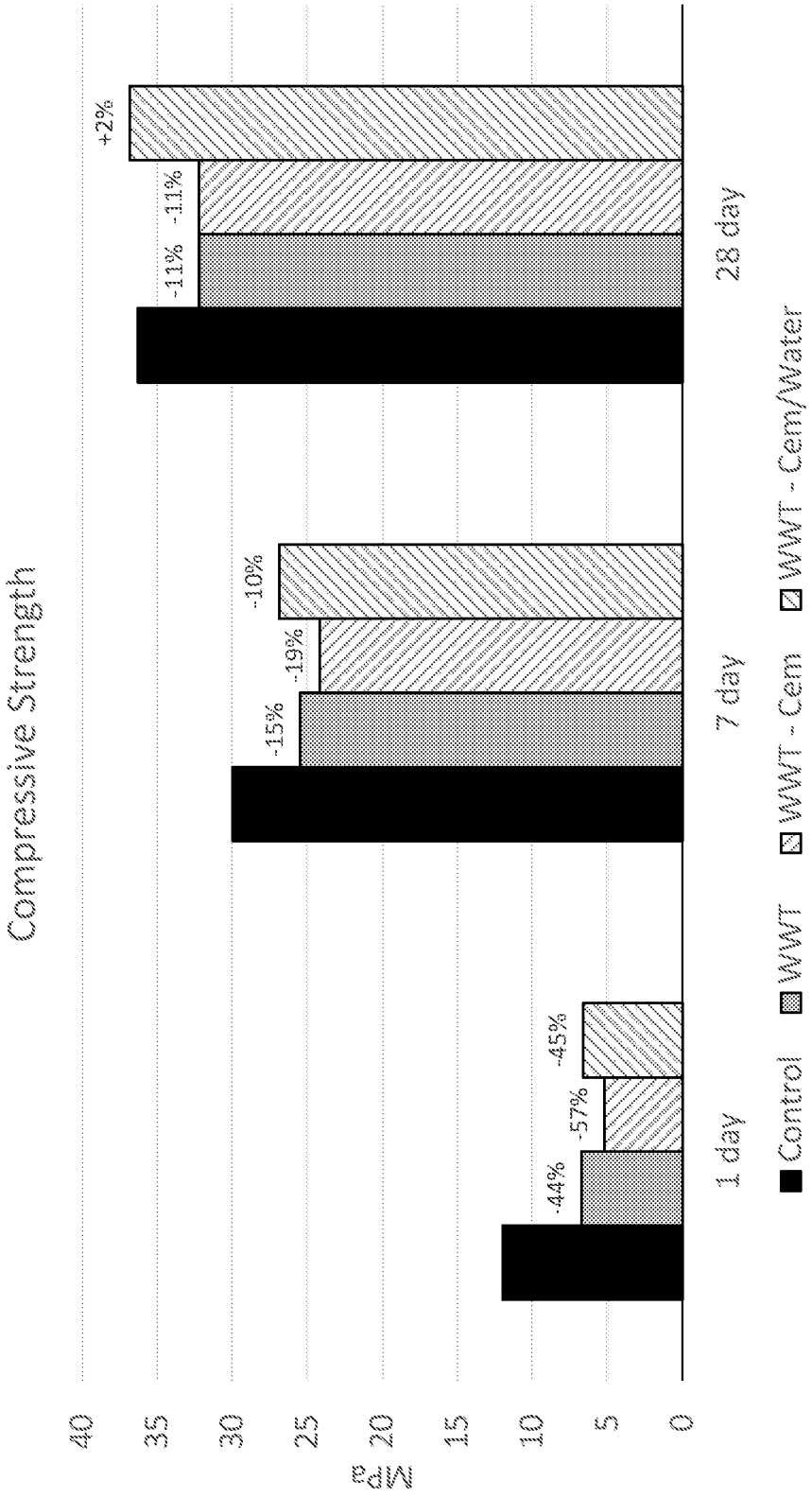

Compressive Strength
MPa
40
35
30
25
20
15
10
5
0
1 day
7 day
28 day
Control
WWT
WWT - Cem
WWT - Cem/Water
+2%
-11%
-11%
-11%
-10%
-19%
-15%
-45%
-57%
-44%

Figure 7

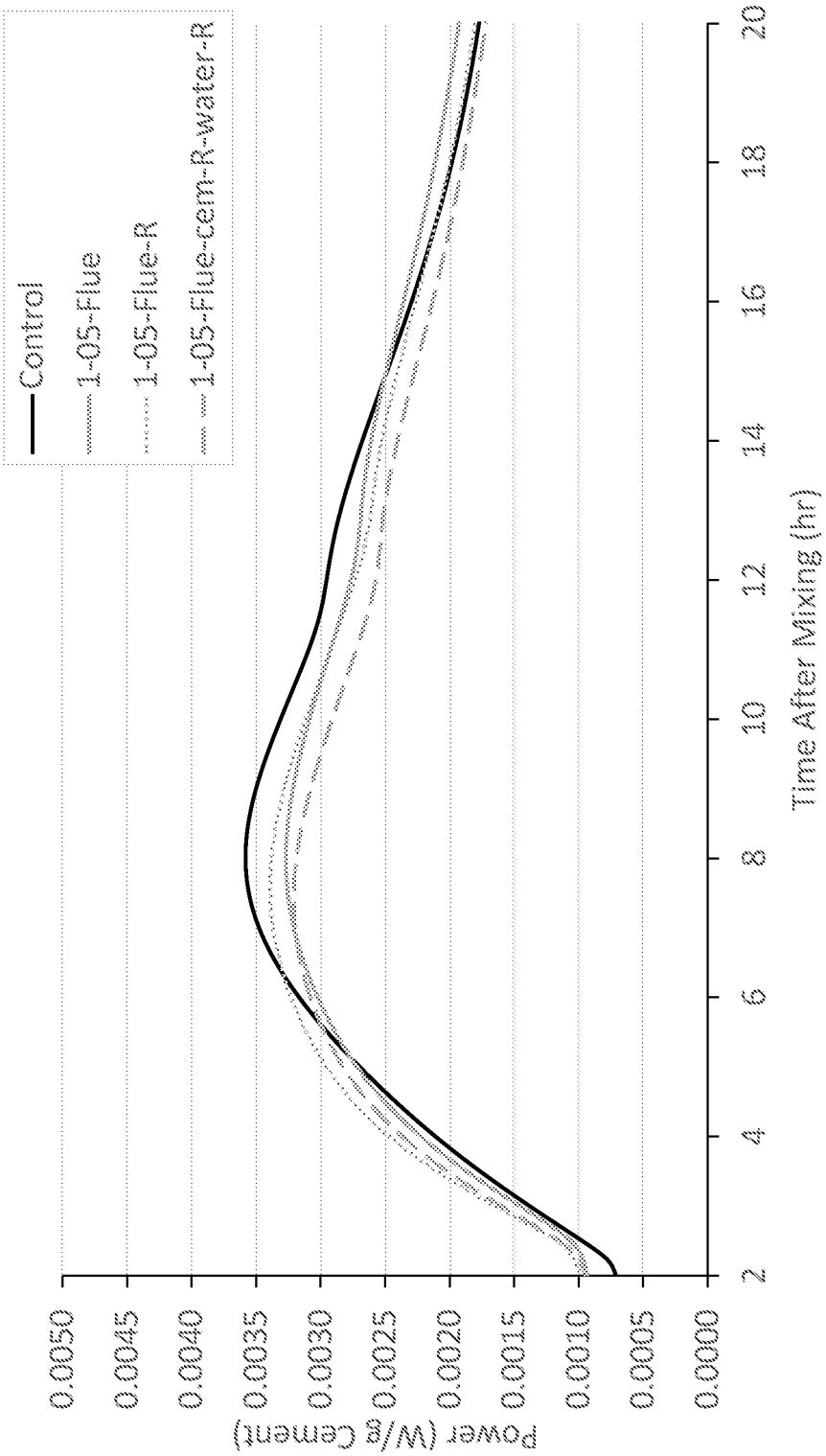

Control
1-05-Flue
1-05-Flue-R
1-05-Flue-cem-R-water-R
Power (W/g cement)
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
Time After Mixing (hr)
2
4
6
8
10
12
14
16
18
20

Figure 8

| Batch ID | Control | WWT | WWT - Cement | WWT – Cement & Water |
|---|---|---|---|---|
| Sand Mass (kg) | 18.99 | 18.99 | 18.99 | 18.99 |
| Coarse Agg Mass (kg) | 26.24 | 26.24 | 26.24 | 26.24 |
| Cement Mass (kg) | 7.50 | 7.50 | 7.125 | 7.125 |
| Fly Ash Mass (kg) | 0 | 0 | 0 | 0 |
| Target batch water (kg) | 4.69 | 4.69 | 4.69 | 4.69 |
| Water Mass (kg) | 4.45 | 0 | 0 | 0 |
| WW mass (kg) | 0.00 | 4.79 | 4.79 | 4.55 |
| Washwater Solids (kg) | 0.00 | 0.34 | 0.34 | 0.32 |
| w/c Ratio | 0.63 | 0.60 | 0.63 | 0.60 |
| Volume (m3) | 0.0242 | 0.0243 | 0.0241 | 0.0239 |

Figure 9

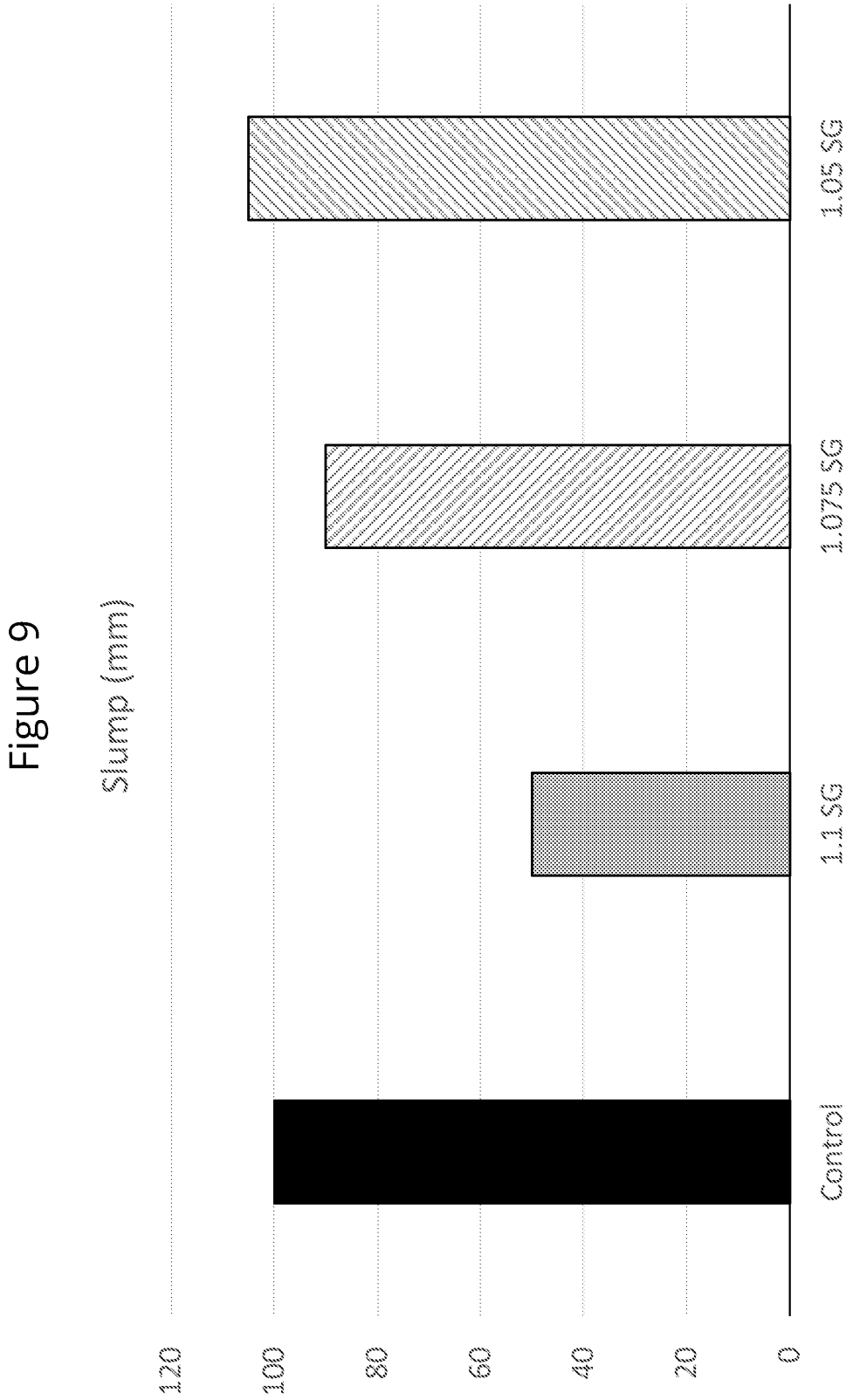


Figure 10

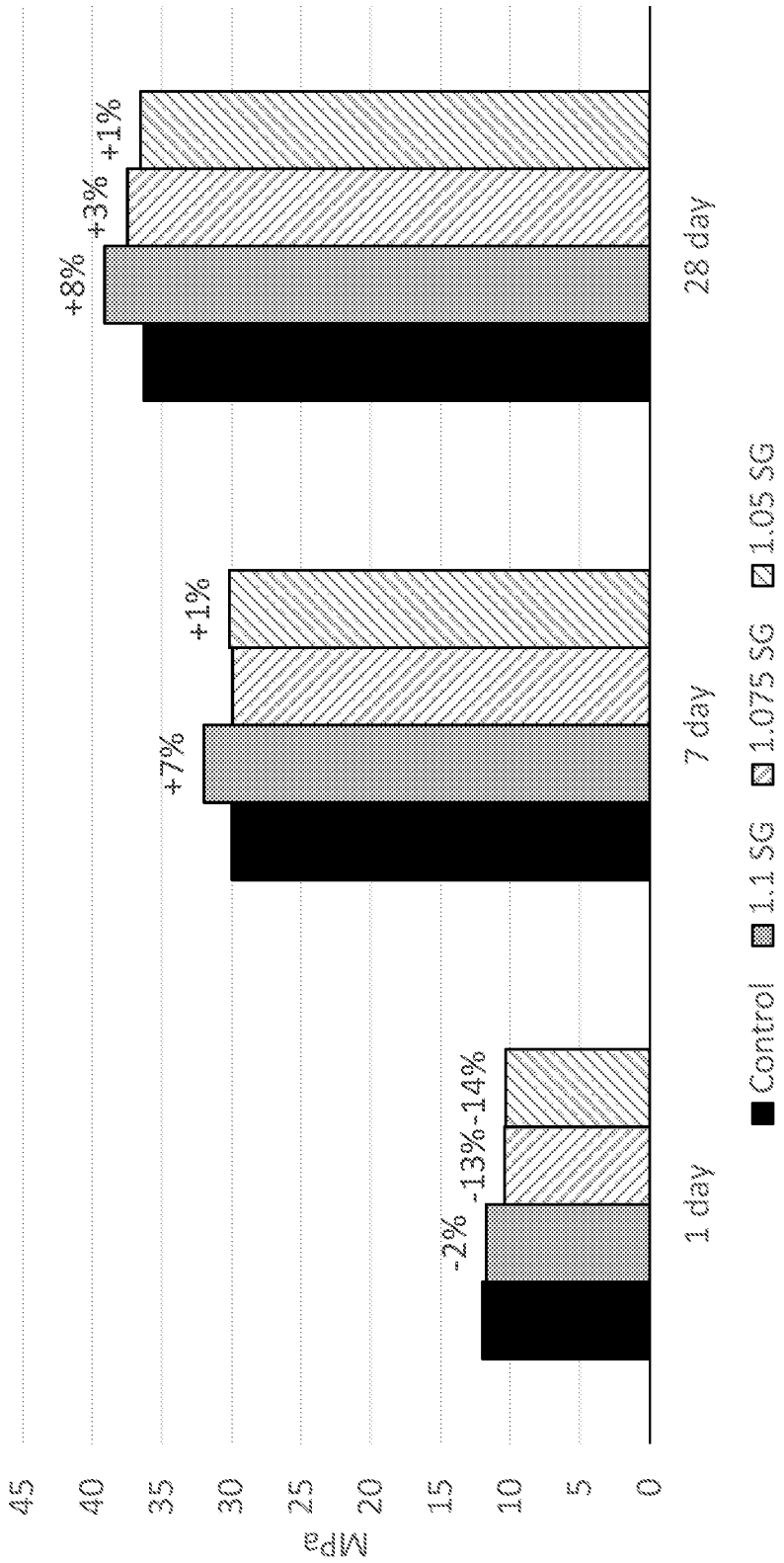

Compressive Strength
MPa
45
40
35
30
25
20
15
10
5
0
1 day
7 day
28 day
-2%
-13%-14%
+7%
+1%
+8%
+3%
+1%
Control
1.1 SG
1.075 SG
1.05 SG

Figure 11

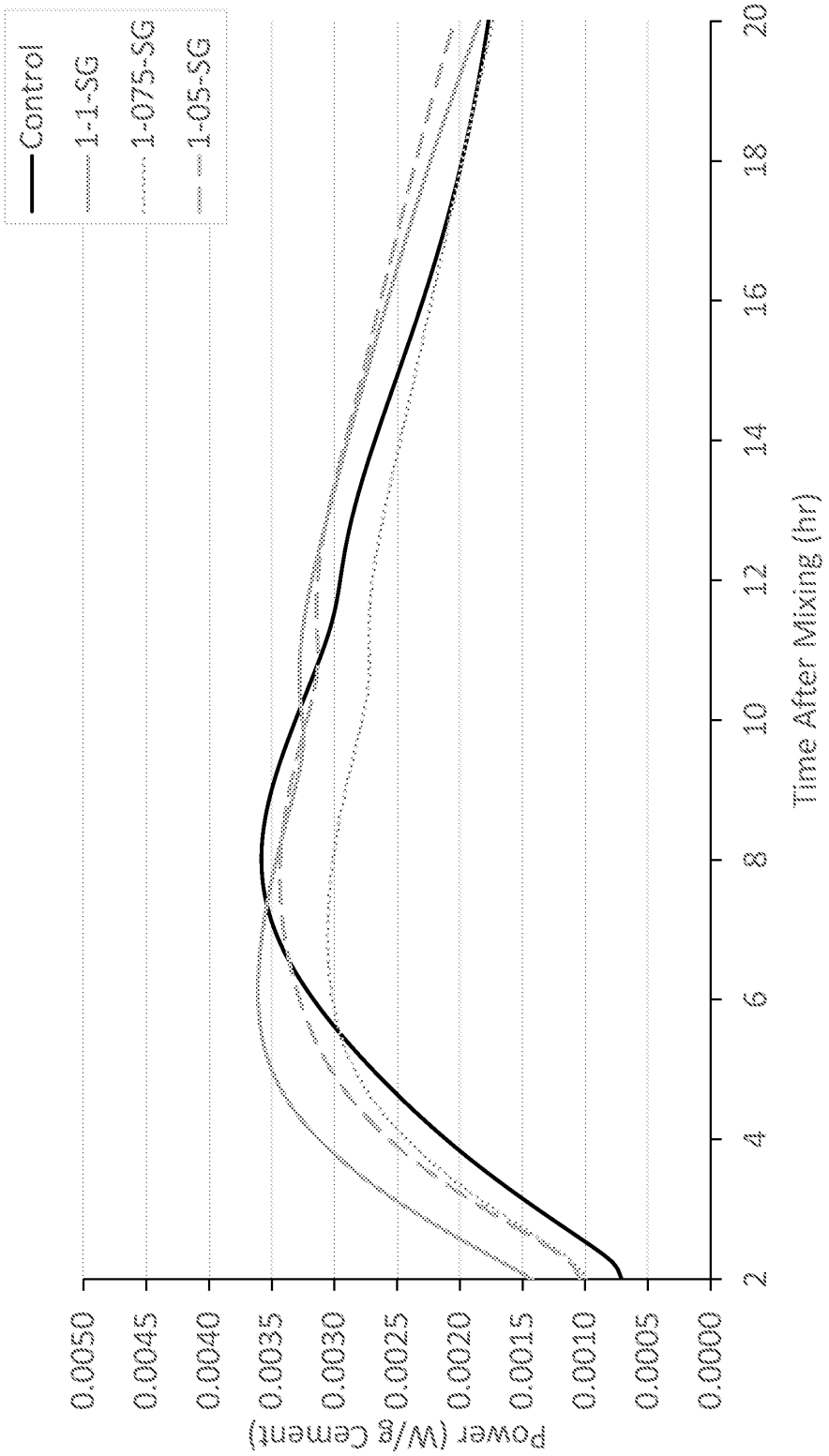

Control
1-1-SG
1-075-SG
1-05-SG
Power (W/g Cement)
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
2
4
6
8
10
12
14
16
18
20
Time After Mixing (hr)

Figure 12

| Batch ID | Control | WWT 1.10 SG | WWT 1.075 SG | WWT 1.05 SG |
|---|---|---|---|---|
| Sand Mass (kg) | 18.99 | 18.99 | 18.99 | 18.99 |
| Coarse Agg Mass (kg) | 26.24 | 26.24 | 26.24 | 26.24 |
| Cement Mass (kg) | 7.50 | 7.50 | 7.50 | 7.125 |
| Cement Type | LBr | LBr | LBr | LBr |
| Target batch water (kg) | 4.69 | 4.69 | 4.69 | 4.69 |
| Water Mass (kg) | 4.45 | 0 | 0 | 0 |
| WW mass (kg) | 0 | 5.13 | 4.96 | 4.78 |
| Cement in Water (kg) | 0 | 0.68 | 0.51 | 0.33 |
| w/c Ratio | 0.63 | 0.57 | 0.59 | 0.60 |
| Volume ($m^3$) | 0.0242 | 0.0243 | 0.0243 | 0.0243 |

LBr = LaFarge Brookfield

Figure 13

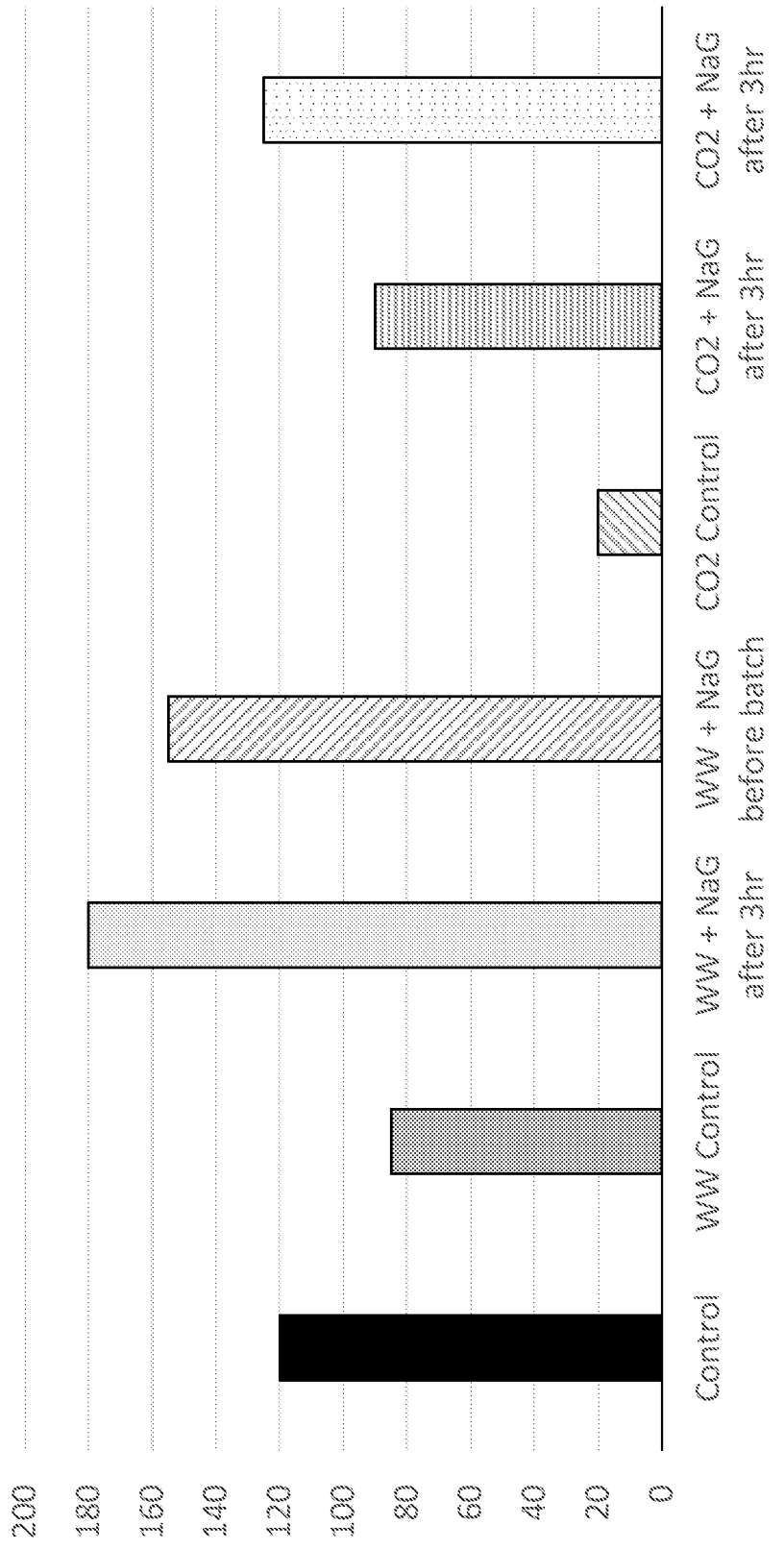

Slump (mm)
200
180
160
140
120
100
80
60
40
20
0
Control
WW Control
WW + NaG after 3hr
WW + NaG before batch
CO2 Control
CO2 + NaG after 3hr
CO2 + NaG after 3hr

Figure 14

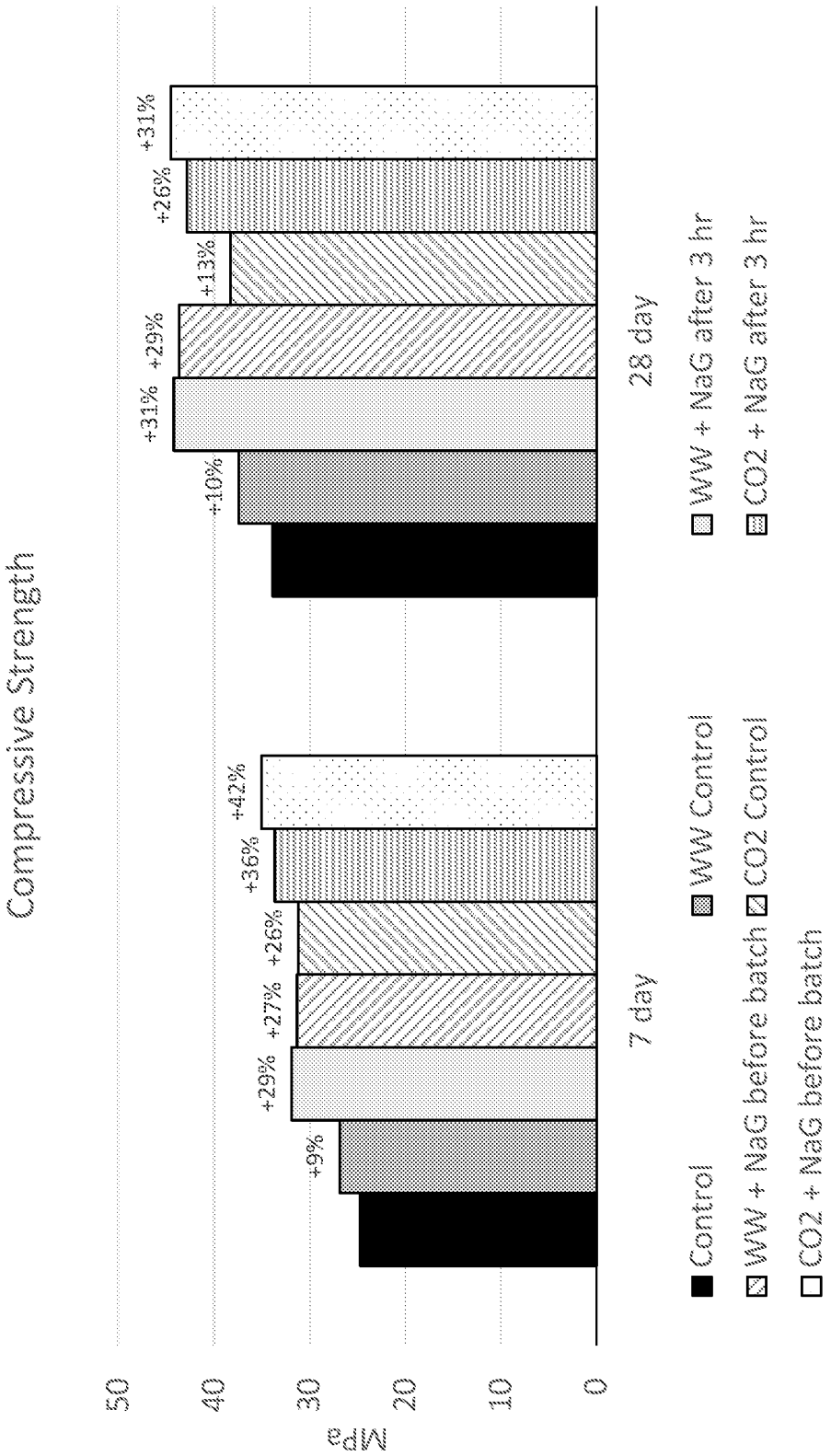
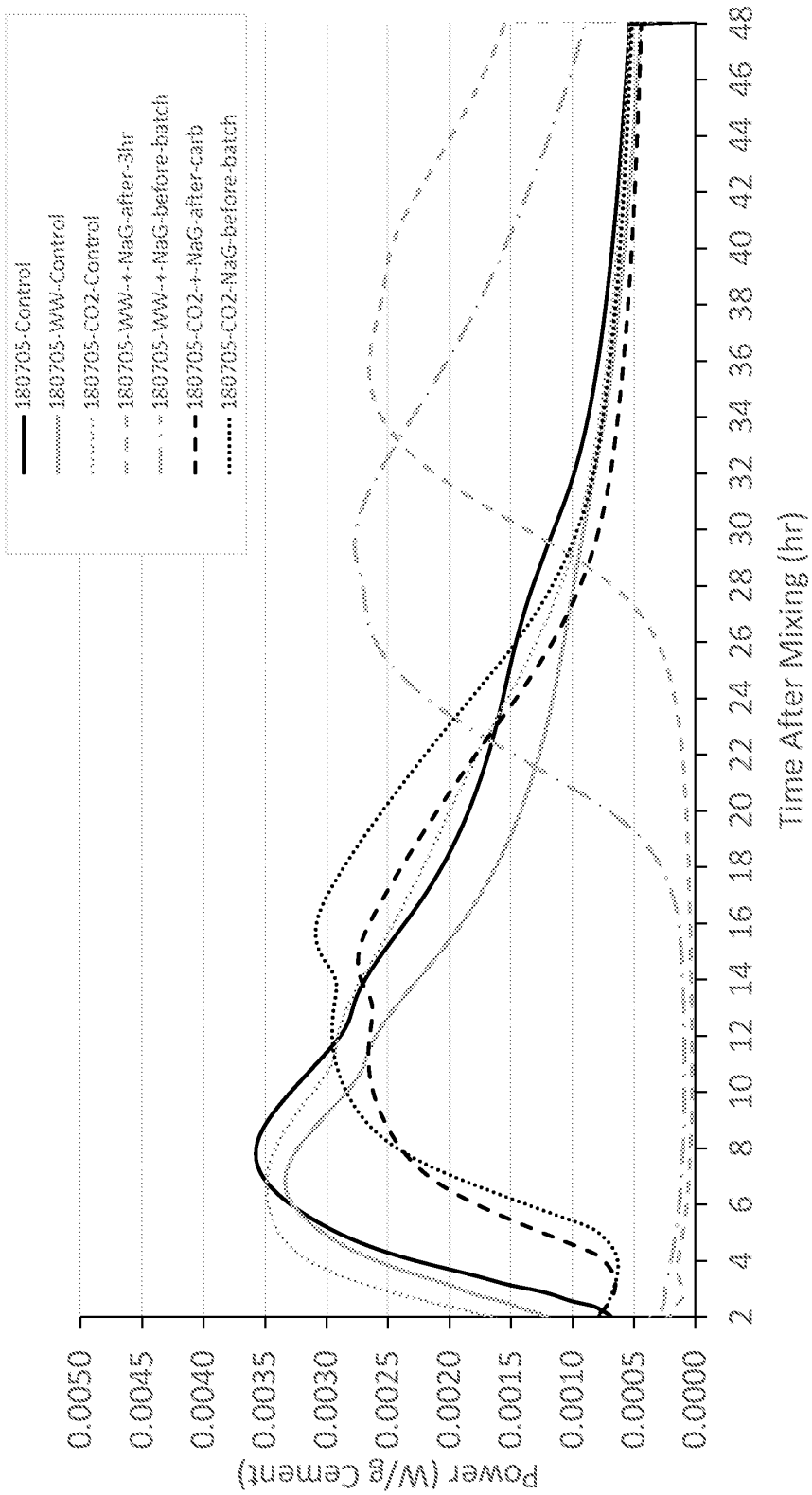

Compressive Strength
MPa
0
10
20
30
40
50
7 day
28 day
+9%
+29%
+27%
+26%
+36%
+42%
+10%
+31%
+29%
+13%
+26%
+31%
Control
WW Control
WW + NaG after 3 hr
WW + NaG before batch
CO2 Control
CO2 + NaG after 3 hr
CO2 + NaG before batch

Figure 15


180705-Control
180705-WW-Control
180705-CO2-Control
180705-WW-+-NaG-after-3hr
180705-WW-+-NaG-before-batch
180705-CO2-+-NaG-after-carb
180705-CO2-NaG-before-batch
Power (W/g Cement)
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
Time After Mixing (hr)
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

# Figure 16

| Batch ID | Control | WW Control | WWT Control | WW NaG after 3 hrs | WW NaG after 24 hrs | WWT NaG after 3 hrs | WWT NaG after 24 hrs |
|---|---|---|---|---|---|---|---|
| Sand Mass (kg) | 18.99 | 18.99 | 18.99 | 18.99 | 18.99 | 18.99 | 18.99 |
| Coarse Agg Mass (kg) | 26.24 | 26.24 | 26.24 | 26.24 | 26.24 | 26.24 | 26.24 |
| Cement Mass (kg) | 7.50 | 6.75 | 7.50 | 7.50 | 7.50 | 7.50 | 7.50 |
| Target batch water (kg) | 4.69 | 4.69 | 4.69 | 4.69 | 4.69 | 4.69 | 4.69 |
| Water Mass (kg) | 4.45 | 0 | 0 | 0 | 0 | 0 | 0 |
| Washwater Mass (kg) | 0 | 5.13 | 5.13 | 5.13 | 5.13 | 5.13 | 5.13 |
| WW Solids Mass (kg) | 0 | 0.68 | 0.68 | 0.68 | 0.68 | 0.68 | 0.68 |
| w/c Ratio | 0.63 | 0.57 | 0.57 | 0.57 | 0.57 | 0.57 | 0.57 |
| Volume ($m^3$) | 0.0242 | 0.0244 | 0.0244 | 0.0244 | 0.0244 | 0.0244 | 0.0244 |

Figure 17

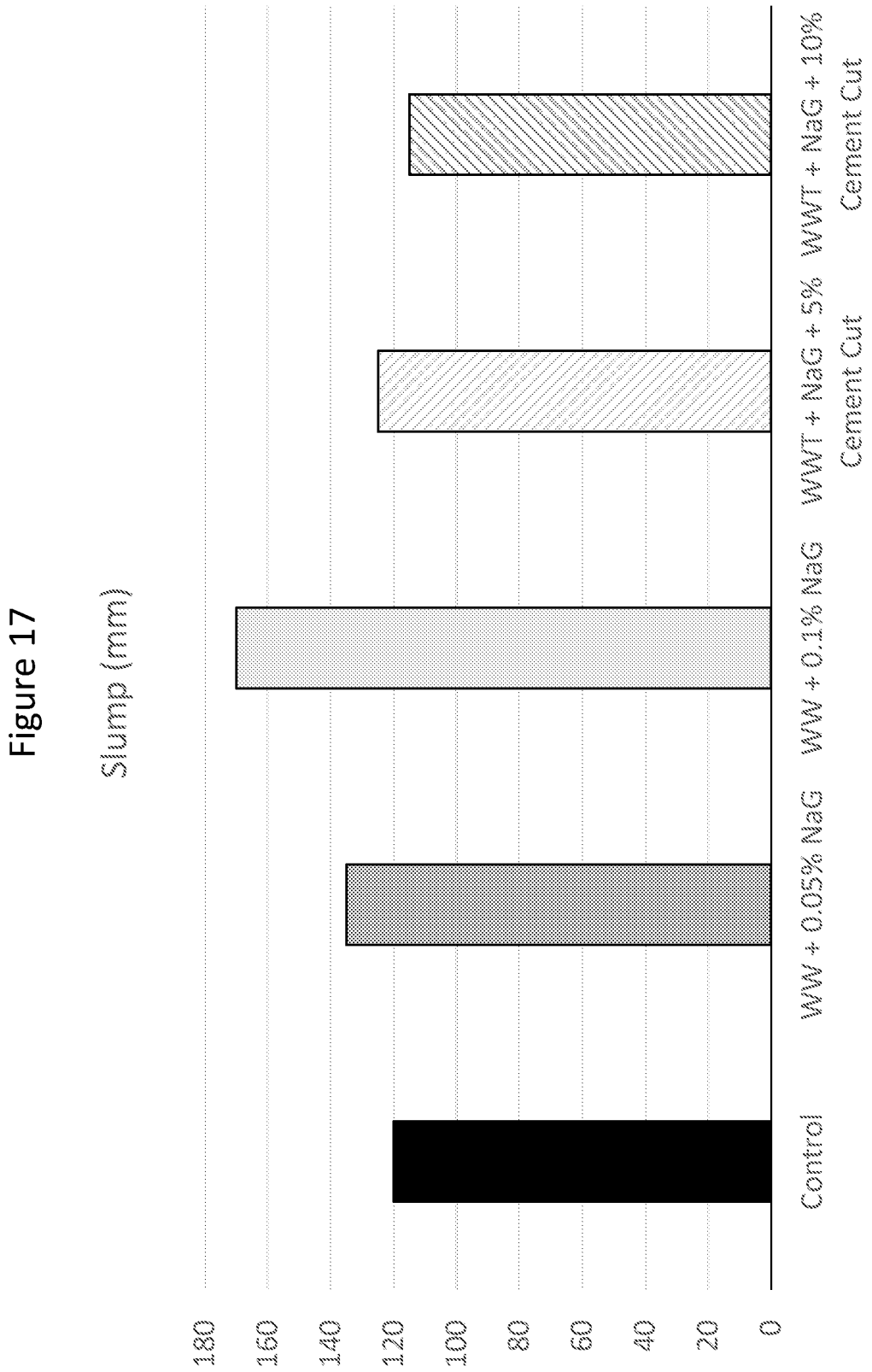

Slump (mm)
180
160
140
120
100
80
60
40
20
0
Control
WW + 0.05% NaG
WW + 0.1% NaG
WWT + NaG + 5% Cement Cut
WWT + NaG + 10% Cement Cut

Figure 18

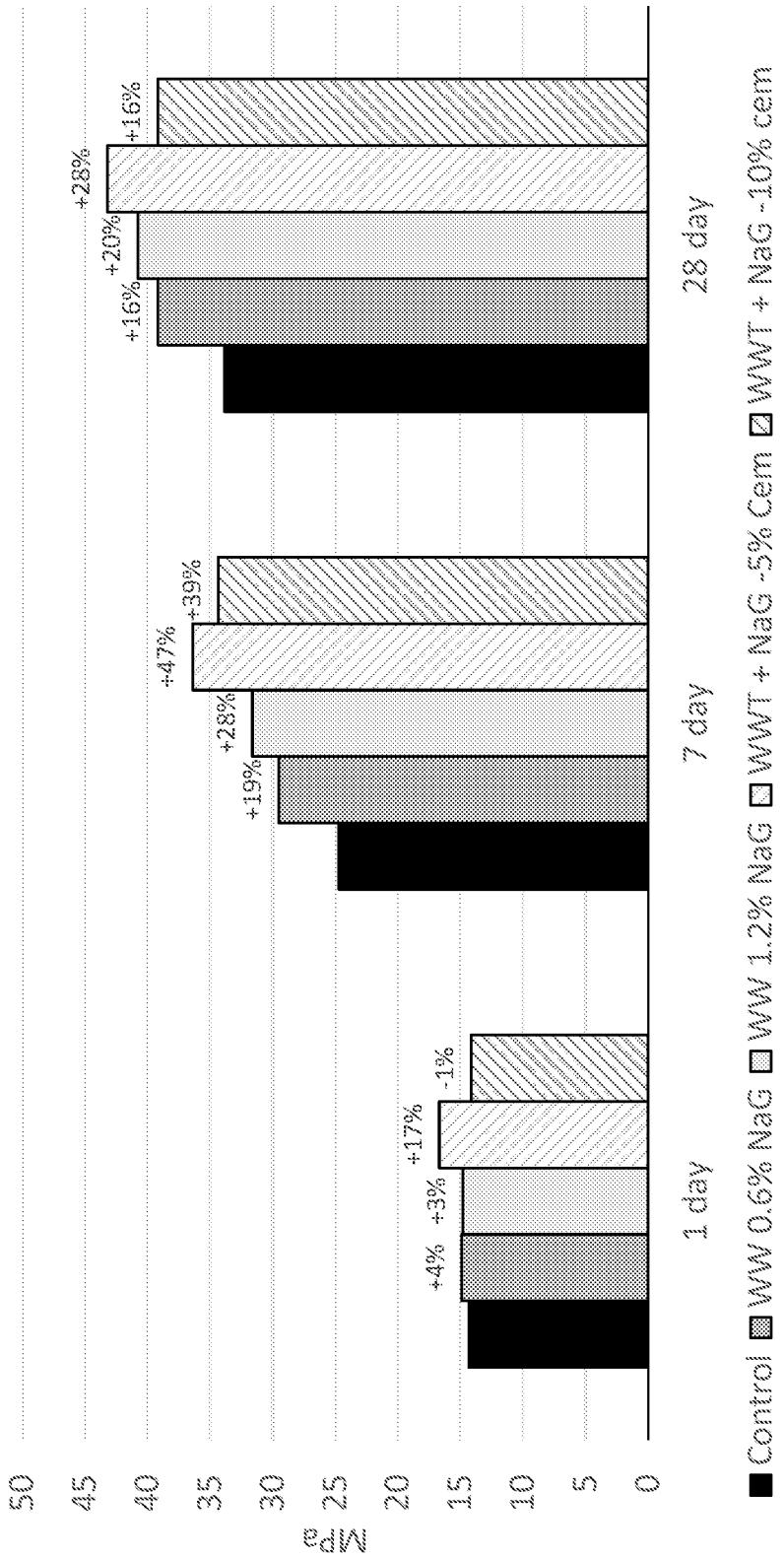

Compressive Strength
MPa
50
45
40
35
30
25
20
15
10
5
0
1 day
7 day
28 day
+4%
+3%
+17%
-1%
+19%
+28%
+47%
+39%
+16%
+20%
+28%
+16%
Control
WW 0.6% NaG
WW 1.2% NaG
WWT + NaG -5% Cem
WWT + NaG -10% cem

Figure 19

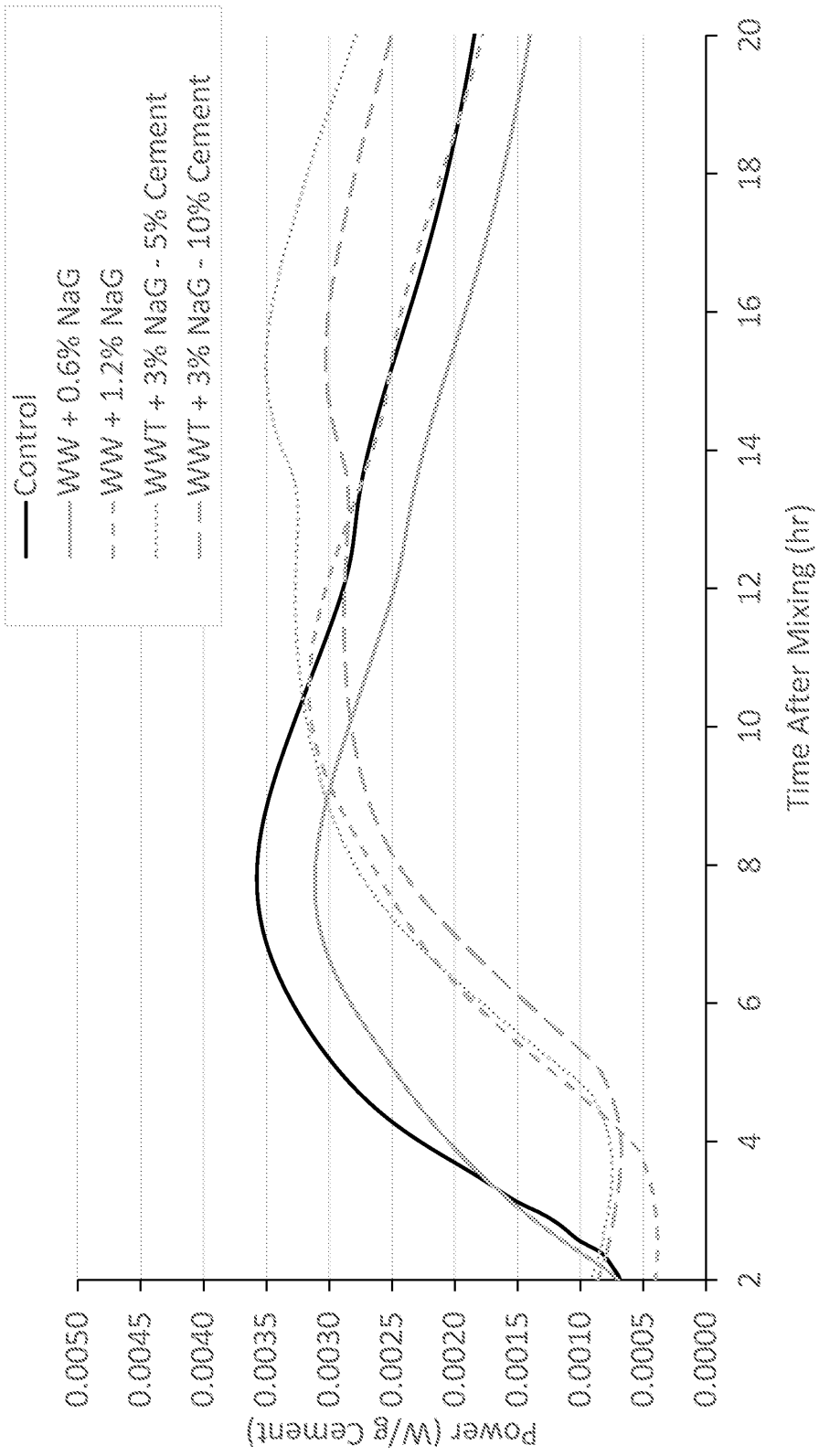

Control
WW + 0.6% NaG
WW + 1.2% NaG
WWT + 3% NaG - 5% Cement
WWT + 3% NaG - 10% Cement
Power (W/g Cement)
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
Time After Mixing (hr)
2
4
6
8
10
12
14
16
18
20

Figure 20

| Batch ID | Control | WW + 0.6% NaG | WW + 1.2% NaG | WWT + NaG + 5% Cement Cut | WWT + NaG + 10% Cement Cut |
|---|---|---|---|---|---|
| Sand Mass (kg) | 18.99 | 18.99 | 18.99 | 18.99 | 18.99 |
| Coarse Agg Mass (kg) | 26.24 | 26.24 | 26.24 | 26.24 | 26.24 |
| Cement Mass (kg) | 7.50 | 7.50 | 7.50 | 7.125 | 6.75 |
| Cement Type | LBr | LBr | LBr | LBr | LBr |
| Target batch water (kg) | 4.69 | 4.69 | 4.69 | 4.69 | 4.69 |
| Water Mass (kg) | 4.45 | 0 | 0 | 0 | 0 |
| WW mass (kg) | 0 | 5.13 | 5.13 | 5.13 | 5.13 |
| Cement in Water (kg) | 0 | 0.68 | 0.68 | 0.68 | 0.68 |
| w/c Ratio | 0.63 | 0.57 | 0.57 | 0.60 | 0.63 |
| Volume ($m^3$) | 0.0242 | 0.0243 | 0.0243 | 0.0242 | 0.0241 |

LBr = LaFarge Brookfield

Figure 21

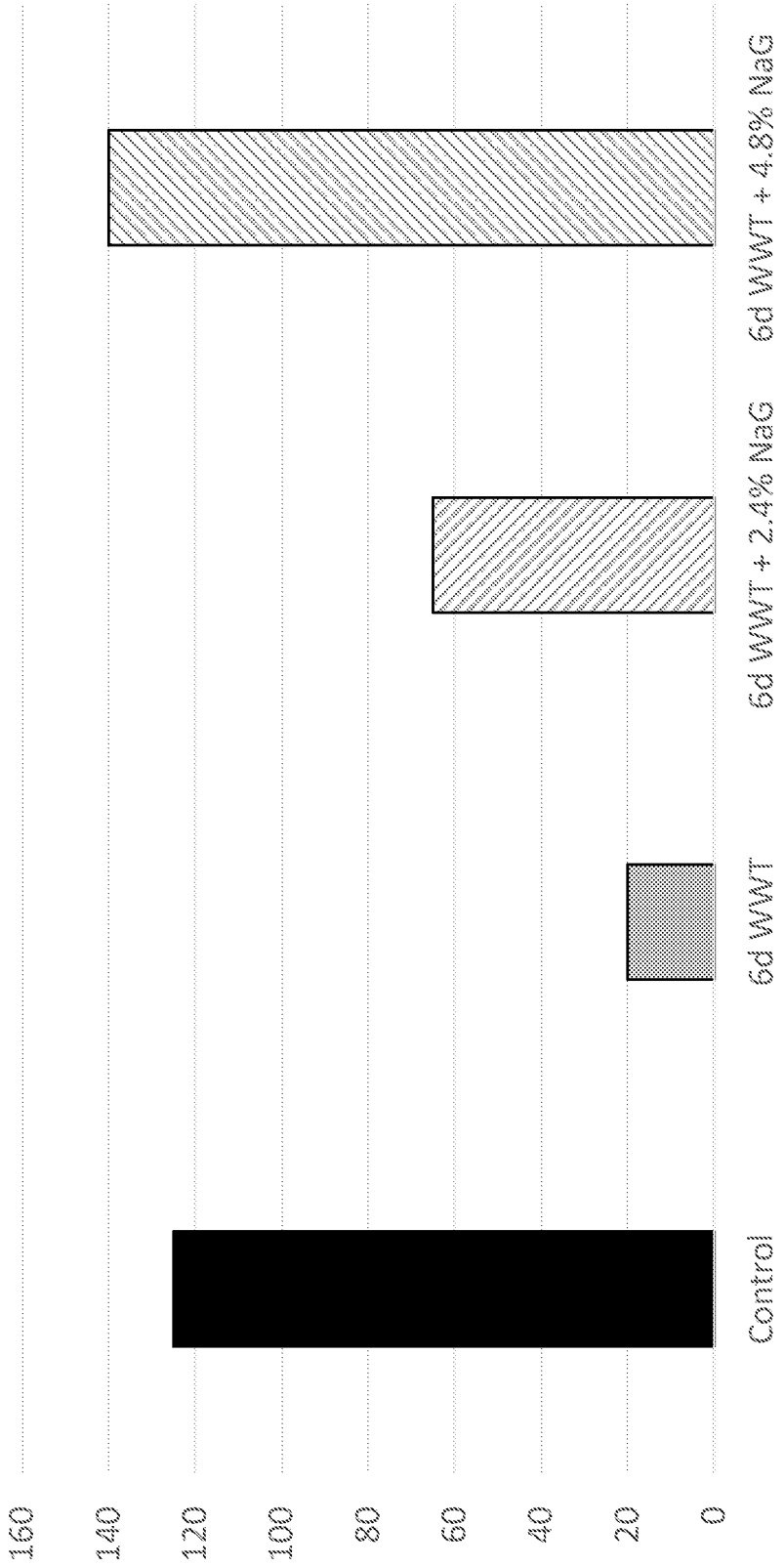

Slump (mm)
160
140
120
100
80
60
40
20
0
Control
6d WWT
6d WWT + 2.4% NaG
6d WWT + 4.8% NaG

Figure 22

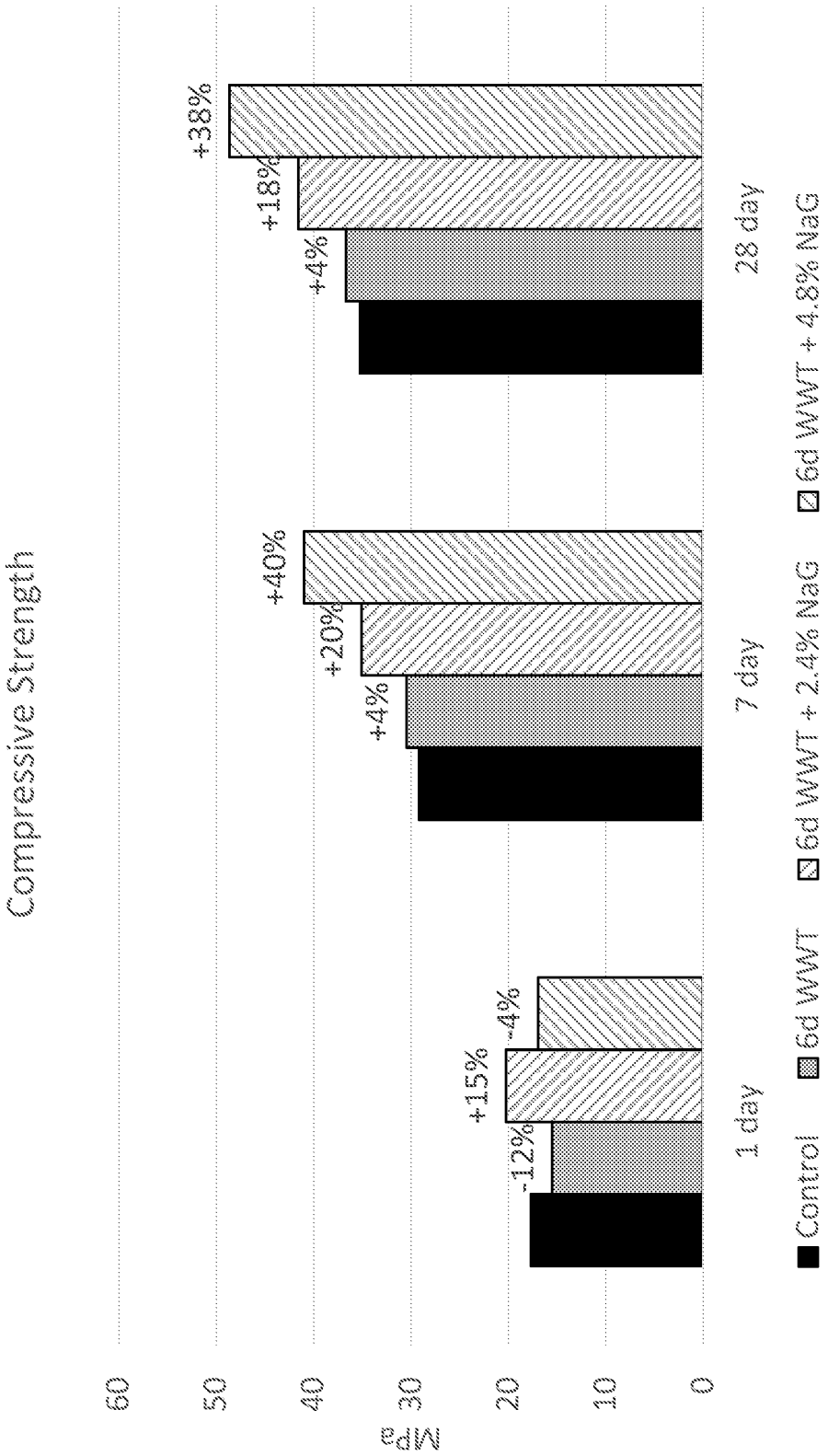

Compressive Strength
MPa
60
50
40
30
20
10
0
+38%
+18%
+4%
+40%
+20%
+4%
+15%
-4%
-12%
28 day
7 day
1 day
Control
6d WWT
6d WWT + 2.4% NaG
6d WWT + 4.8% NaG

Figure 23

| Batch ID | Control | 6d WWT | 6d WWT + 2.4% NaG | 6d WWT + 4.8% NaG |
|---|---|---|---|---|
| Sand Mass (kg) | 18.99 | 18.99 | 18.99 | 18.99 |
| Coarse Agg Mass (kg) | 26.24 | 26.24 | 26.24 | 26.24 |
| Cement Mass (kg) | 7.50 | 7.50 | 7.50 | 7.50 |
| Fly Ash Mass (kg) | 0 | 0 | 0 | 0 |
| Target batch water (kg) | 4.69 | 4.69 | 4.69 | 4.69 |
| Water Mass (kg) | 4.45 | 0 | 0 | 0 |
| WW mass (kg) | 0.00 | 5.13 | 5.13 | 5.13 |
| Washwater Solids (kg) | 0.00 | 0.68 | 0.68 | 0.68 |
| w/c Ratio | 0.60 | 0.57 | 0.57 | 0.57 |
| Volume (m3) | 0.0242 | 0.0244 | 0.0244 | 0.0244 |

Figure 24

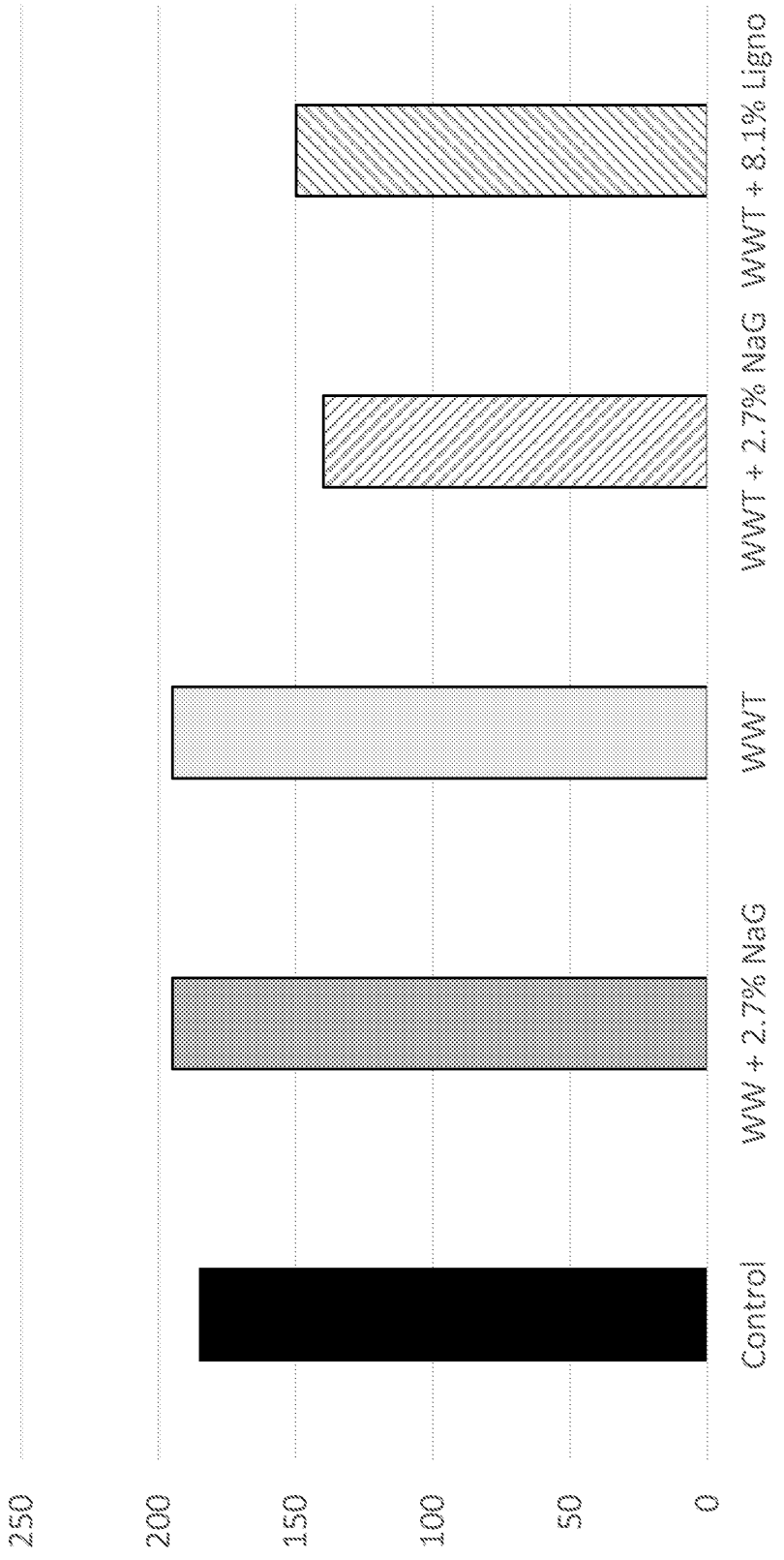

Slump (mm)
250
200
150
100
50
0
Control
WW + 2.7% NaG
WWT
WWT + 2.7% NaG
WWT + 8.1% Ligno

Figure 25

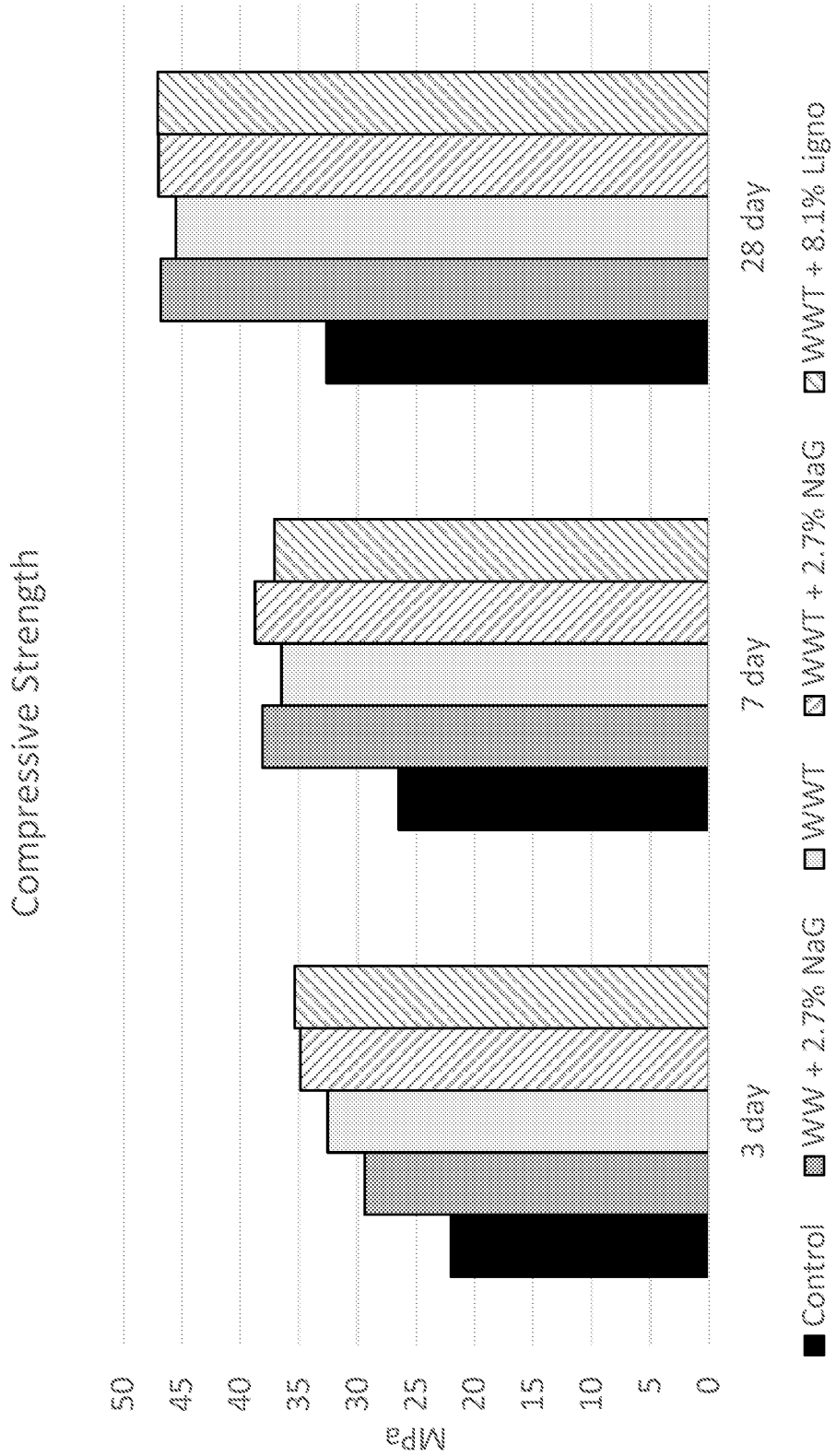

Compressive Strength
MPa
50
45
40
35
30
25
20
15
10
5
0
3 day
7 day
28 day
Control
WW + 2.7% NaG
WWT
WWT + 2.7% NaG
WWT + 8.1% Ligno

Figure 26

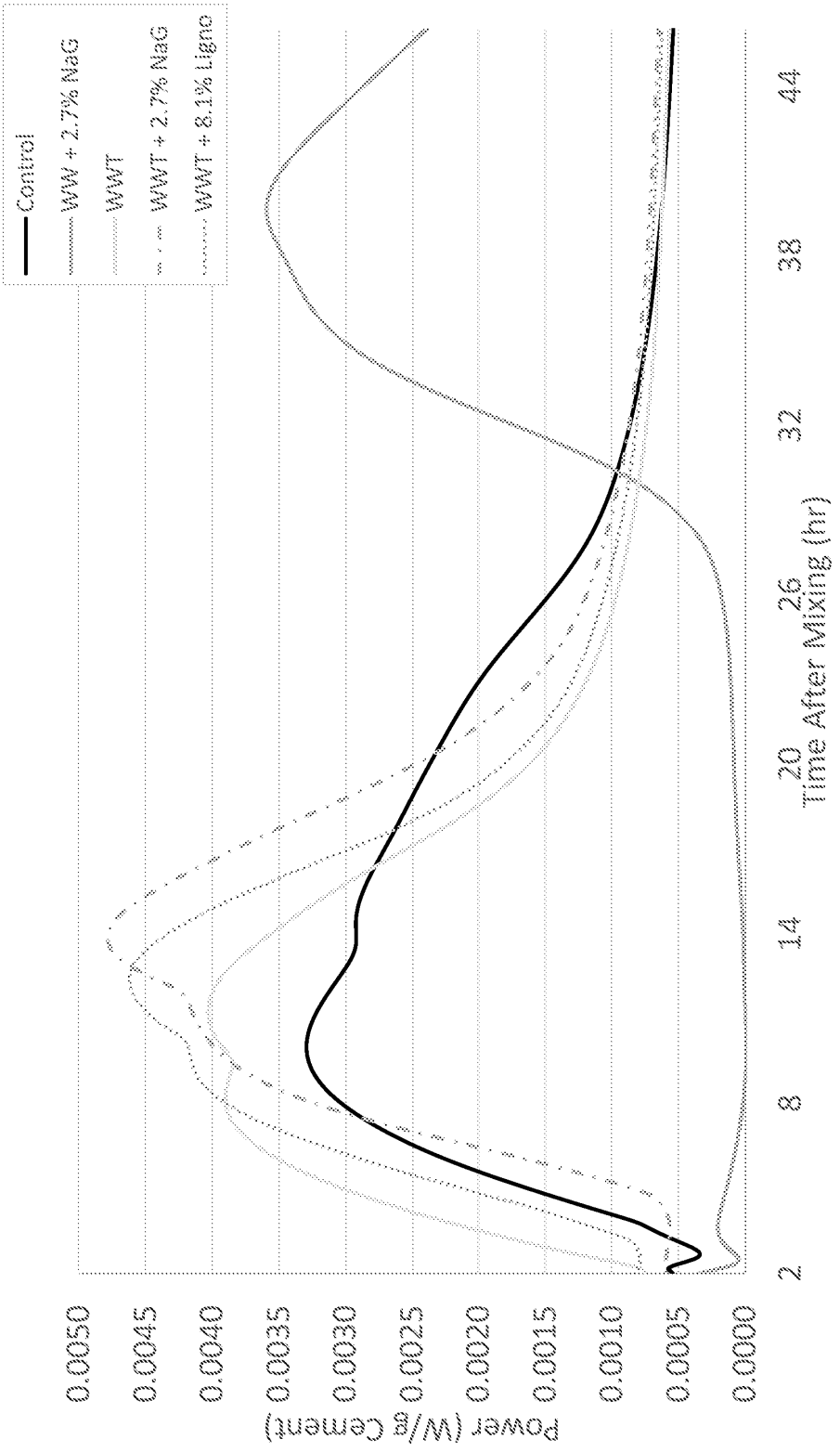

Control
WW + 2.7% NaG
WWT
WWT + 2.7% NaG
WWT + 8.1% Ligno
Power (W/g Cement)
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
2
8
14
20
26
32
38
44
Time After Mixing (hr)

Figure 27

| Batch ID | Control | WW + NaG | WWT | WWT + NaG | WWT + Ligno |
|---|---|---|---|---|---|
| Sand Mass (kg) | 22.90 | 22.90 | 22.90 | 22.90 | 22.90 |
| Coarse Agg Mass (kg) | 27.18 | 27.18 | 27.18 | 27.18 | 27.18 |
| Cement Mass (kg) | 6.88 | 6.88 | 6.88 | 6.88 | 6.88 |
| Fly Ash Mass (kg) | 1.72 | 1.72 | 1.72 | 1.72 | 1.72 |
| Target batch water (kg) | 3.87 | 3.87 | 3.87 | 3.87 | 3.87 |
| Water Mass (kg) | 3.58 | 0.00 | 0.00 | 0.00 | 0.00 |
| Washwater Mass (kg) | 0.00 | 4.13 | 4.13 | 4.13 | 4.13 |
| WW Solids Mass (kg) | 0 | 0.55 | 0.55 | 0.55 | 0.55 |
| w/c Ratio | 0.45 | 0.42 | 0.42 | 0.42 | 0.42 |
| Volume ($m^3$) | 0.0257 | 0.0258 | 0.0258 | 0.0258 | 0.0258 |

Figure 28

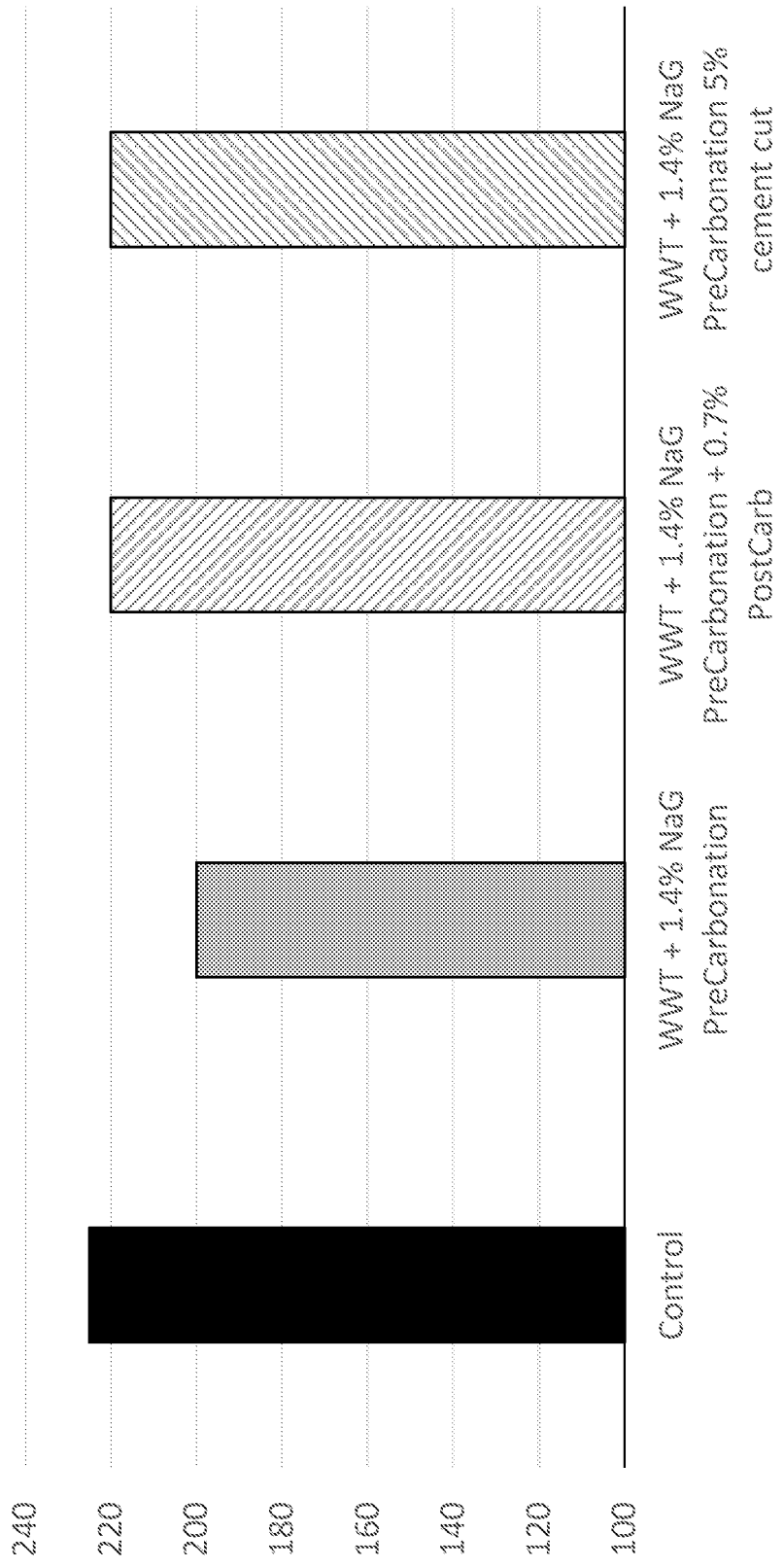

Slump (mm)
240
220
200
180
160
140
120
100
Control
WWT + 1.4% NaG PreCarbonation
WWT + 1.4% NaG PreCarbonation + 0.7% PostCarb
WWT + 1.4% NaG PreCarbonation 5% cement cut

Figure 29

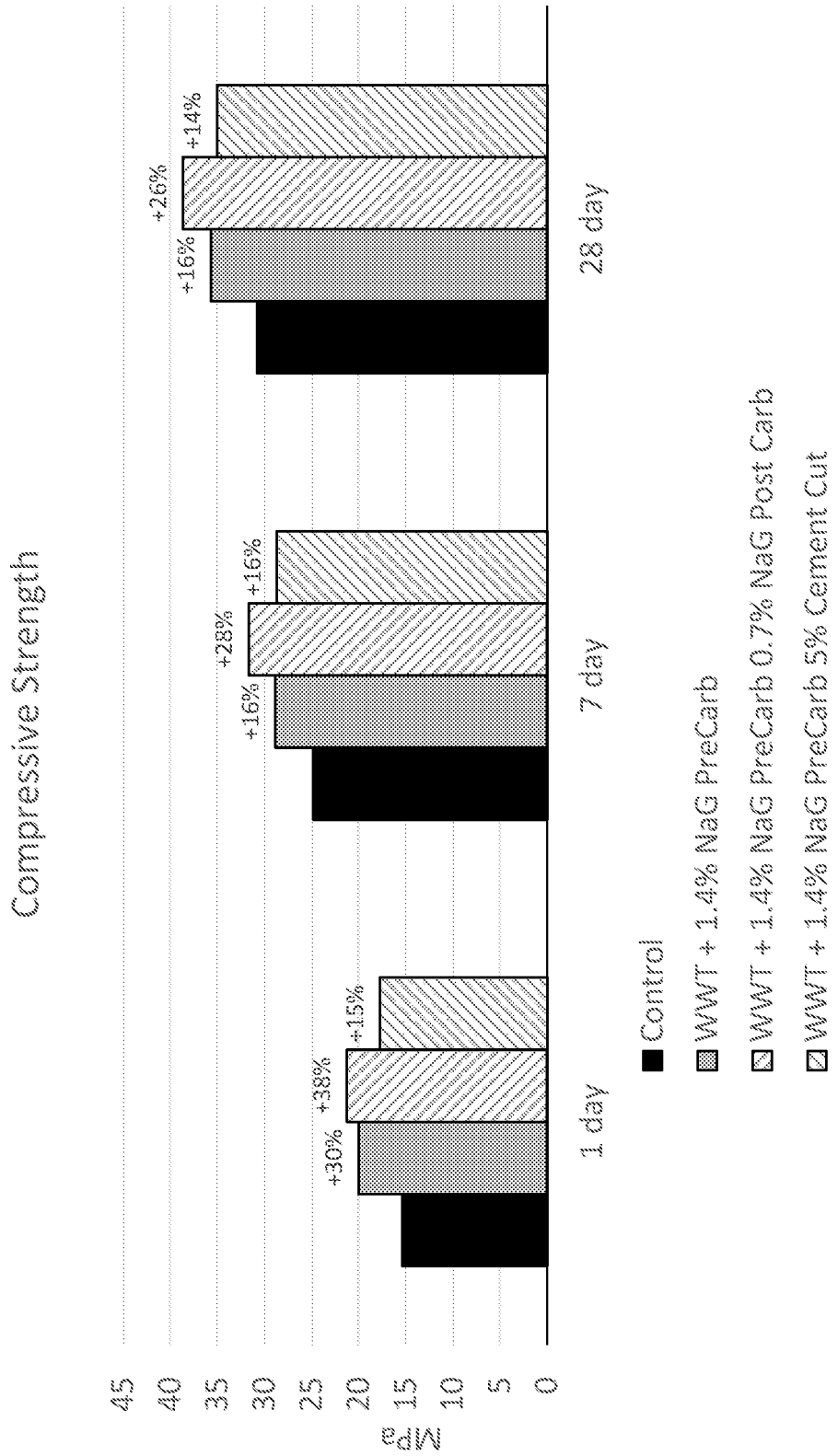
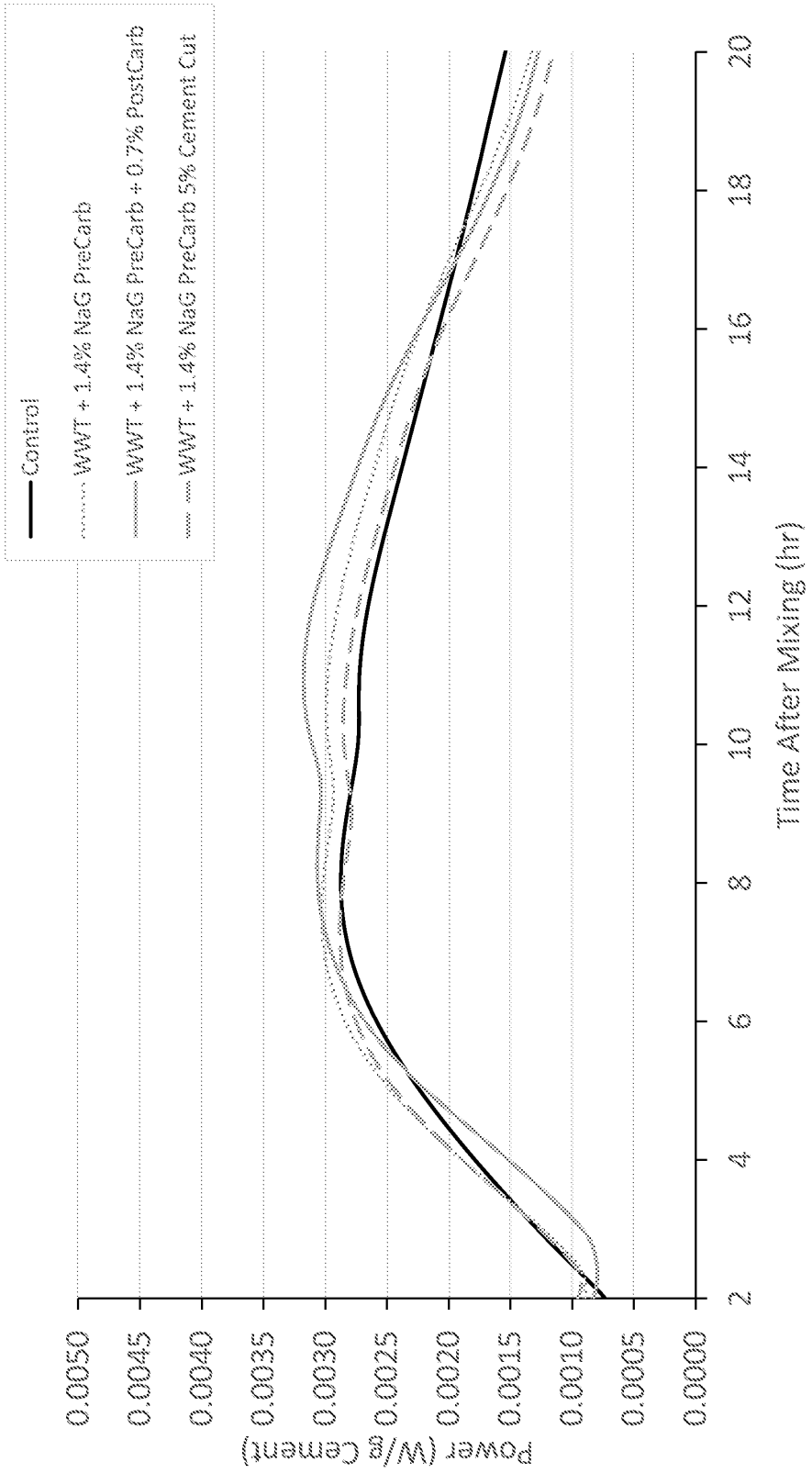

Compressive Strength
MPa
45
40
35
30
25
20
15
10
5
0
1 day
7 day
28 day
+15%
+38%
+30%
+16%
+28%
+16%
+14%
+26%
+16%
Control
WWT + 1.4% NaG PreCarb
WWT + 1.4% NaG PreCarb 0.7% NaG Post Carb
WWT + 1.4% NaG PreCarb 5% Cement Cut

Figure 30


Control
WWT + 1.4% NaG PreCarb
WWT + 1.4% NaG PreCarb + 0.7% PostCarb
WWT + 1.4% NaG PreCarb 5% Cement Cut
Power (W/g cement)
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
Time After Mixing (hr)
2
4
6
8
10
12
14
16
18
20

# Figure 31

| Batch ID | Control | WWT + 1.4% NaG PreCarbonation | WWT + 2% NaG PreCarbonation + 0.5% PostCarb | WWT + 1.4% NaG PreCarbonation 5% cement cut |
|---|---|---|---|---|
| Sand Mass (kg) | 22.90 | 22.90 | 22.90 | 22.90 |
| Coarse Agg Mass (kg) | 27.18 | 27.18 | 27.18 | 27.18 |
| Cement Mass (kg) | 6.88 | 6.88 | 6.88 | 6.54 |
| Fly Ash Mass (kg) | 1.72 | 1.72 | 1.72 | 1.63 |
| Target batch water (kg) | 3.87 | 3.87 | 3.87 | 3.87 |
| Water Mass (kg) | 3.58 | 0.00 | 0.00 | 0.00 |
| WW mass (kg) | 0.00 | 4.13 | 4.13 | 4.13 |
| Washwater Solids (kg) | 0.00 | 0.55 | 0.55 | 0.55 |
| w/c Ratio | 0.50 | 0.47 | 0.47 | 0.49 |
| Volume (m3) | 0.0261 | 0.0262 | 0.0262 | 0.0262 |

Figure 32

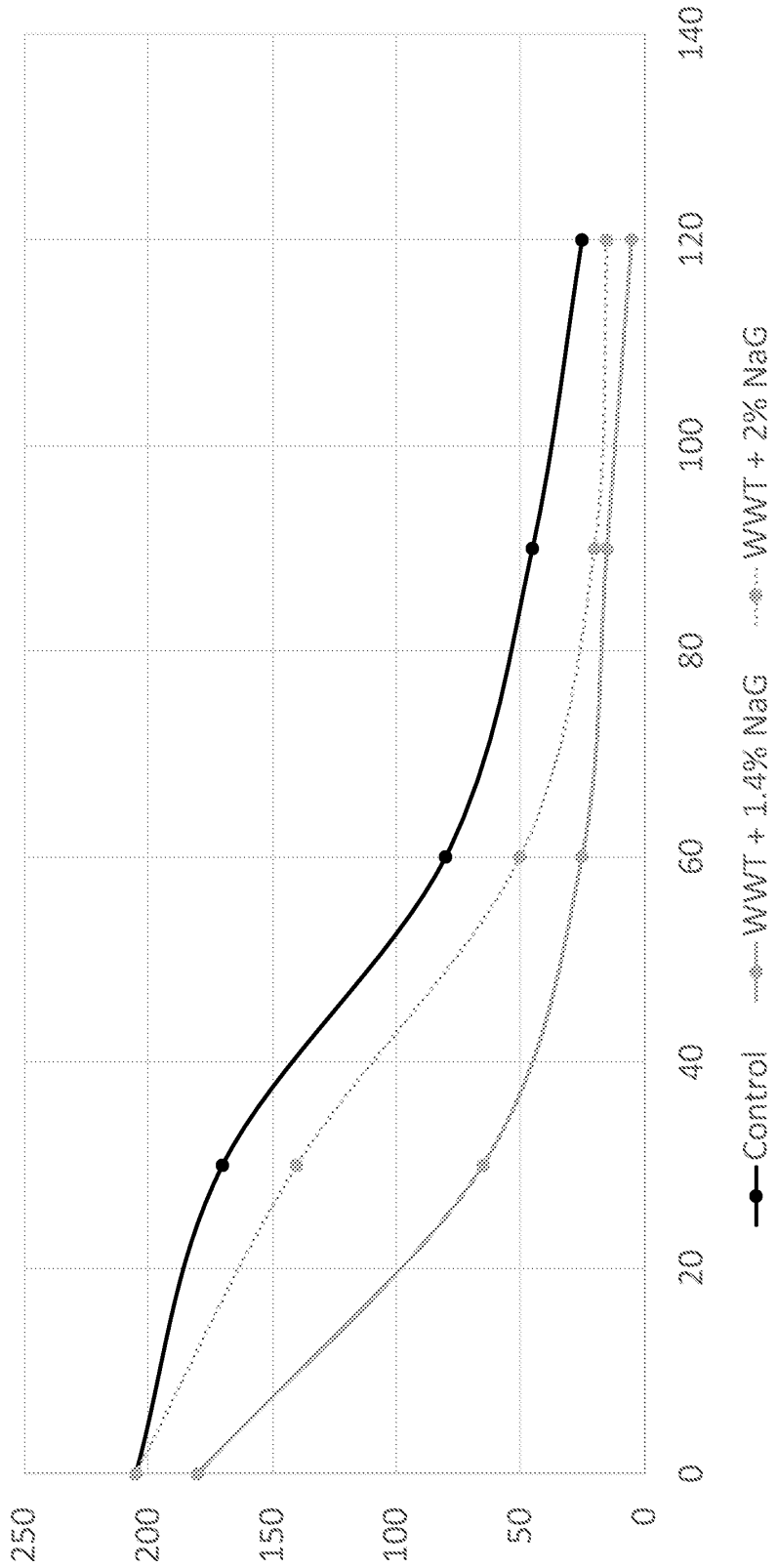

Slump (mm)
250
200
150
100
50
0
0
20
40
60
80
100
120
140
Control
WWT + 1.4% NaG
WWT + 2% NaG

Figure 33

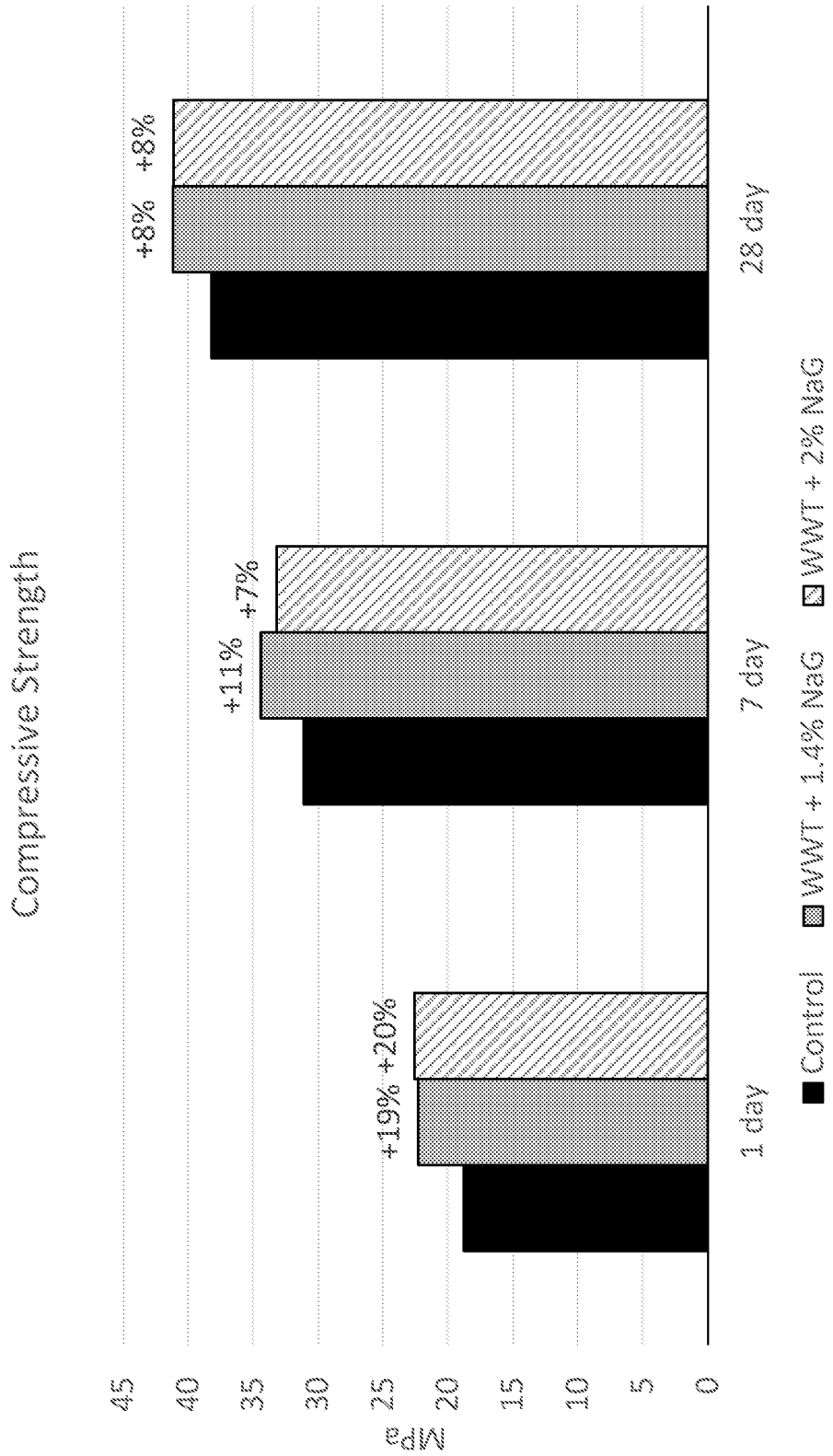

Compressive Strength
MPa
45
40
35
30
25
20
15
10
5
0
+8%
+8%
+11%
+7%
+19%
+20%
28 day
7 day
1 day
Control
WWT + 1.4% NaG
WWT + 2% NaG

Figure 34

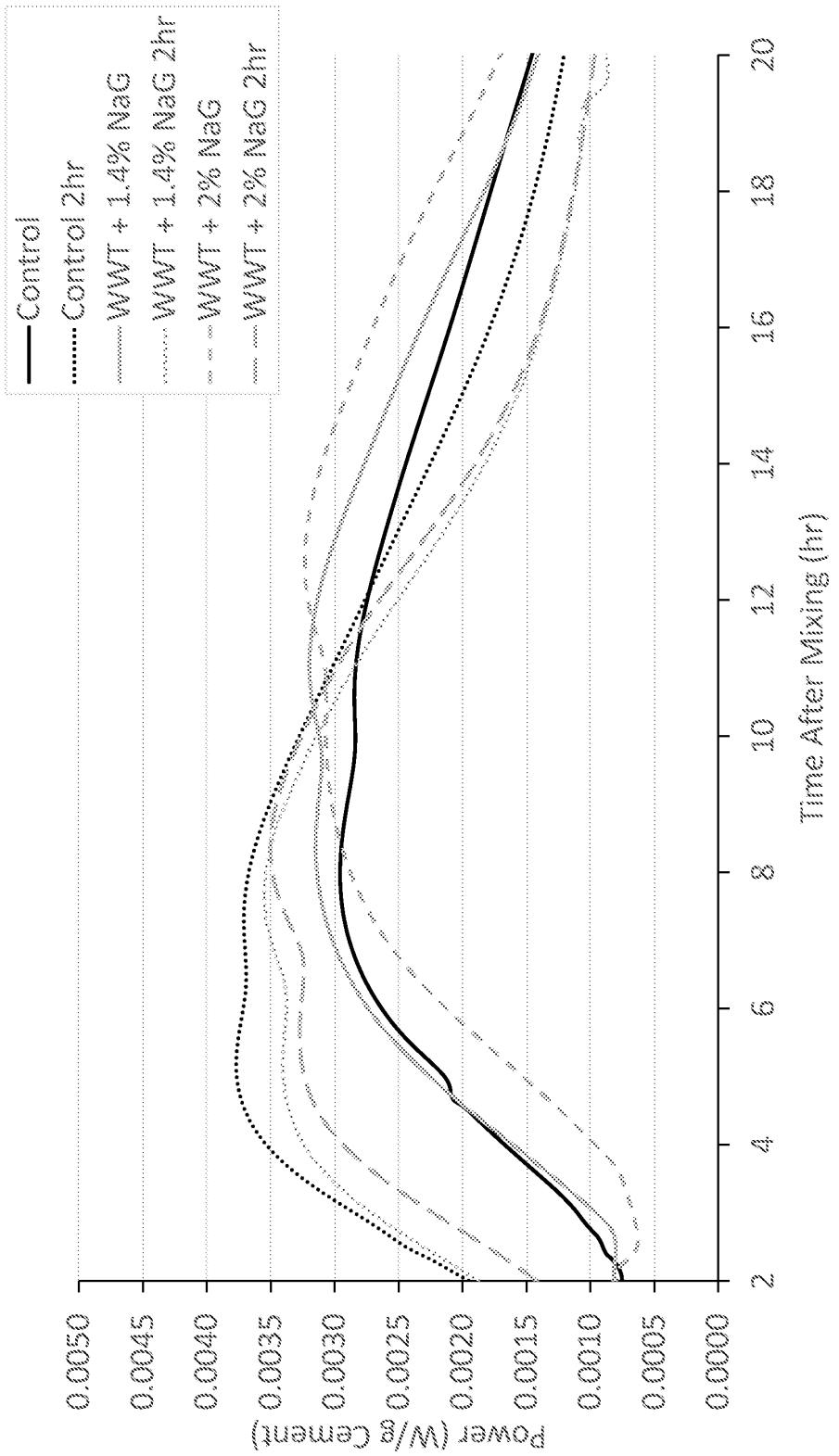

Control
Control 2hr
WWT + 1.4% NaG
WWT + 1.4% NaG 2hr
WWT + 2% NaG
WWT + 2% NaG 2hr
Power (W/g Cement)
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
Time After Mixing (hr)
2
4
6
8
10
12
14
16
18
20

Figure 35

| Batch ID | Control | WWT + 1.4% NaG | WWT + 2% NaG |
|---|---|---|---|
| Sand Mass (kg) | 22.90 | 22.90 | 22.90 |
| Coarse Agg Mass (kg) | 27.18 | 27.18 | 27.18 |
| Cement Mass (kg) | 6.88 | 6.88 | 6.88 |
| Fly Ash Mass (kg) | 1.72 | 1.72 | 1.72 |
| Target batch water (kg) | 3.87 | 3.87 | 3.87 |
| Water Mass (kg) | 3.58 | 0.00 | 0.00 |
| WW mass (kg) | 0.00 | 4.13 | 4.13 |
| Washwater Solids (kg) | 0.00 | 0.55 | 0.55 |
| w/c Ratio | 0.45 | 0.42 | 0.42 |
| Volume (m3) | 0.0257 | 0.0258 | 0.0258 |

Figure 36

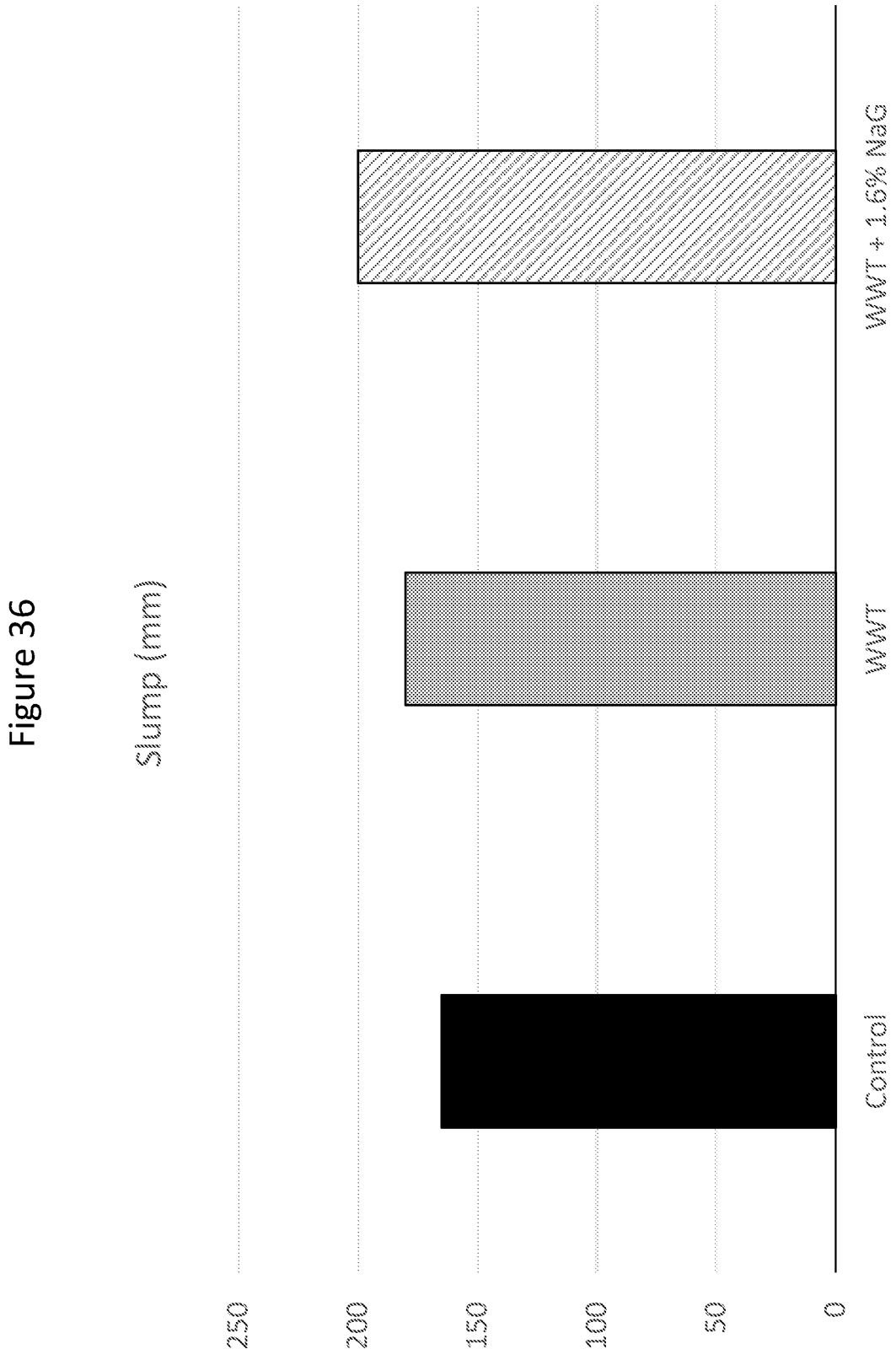


Figure 37

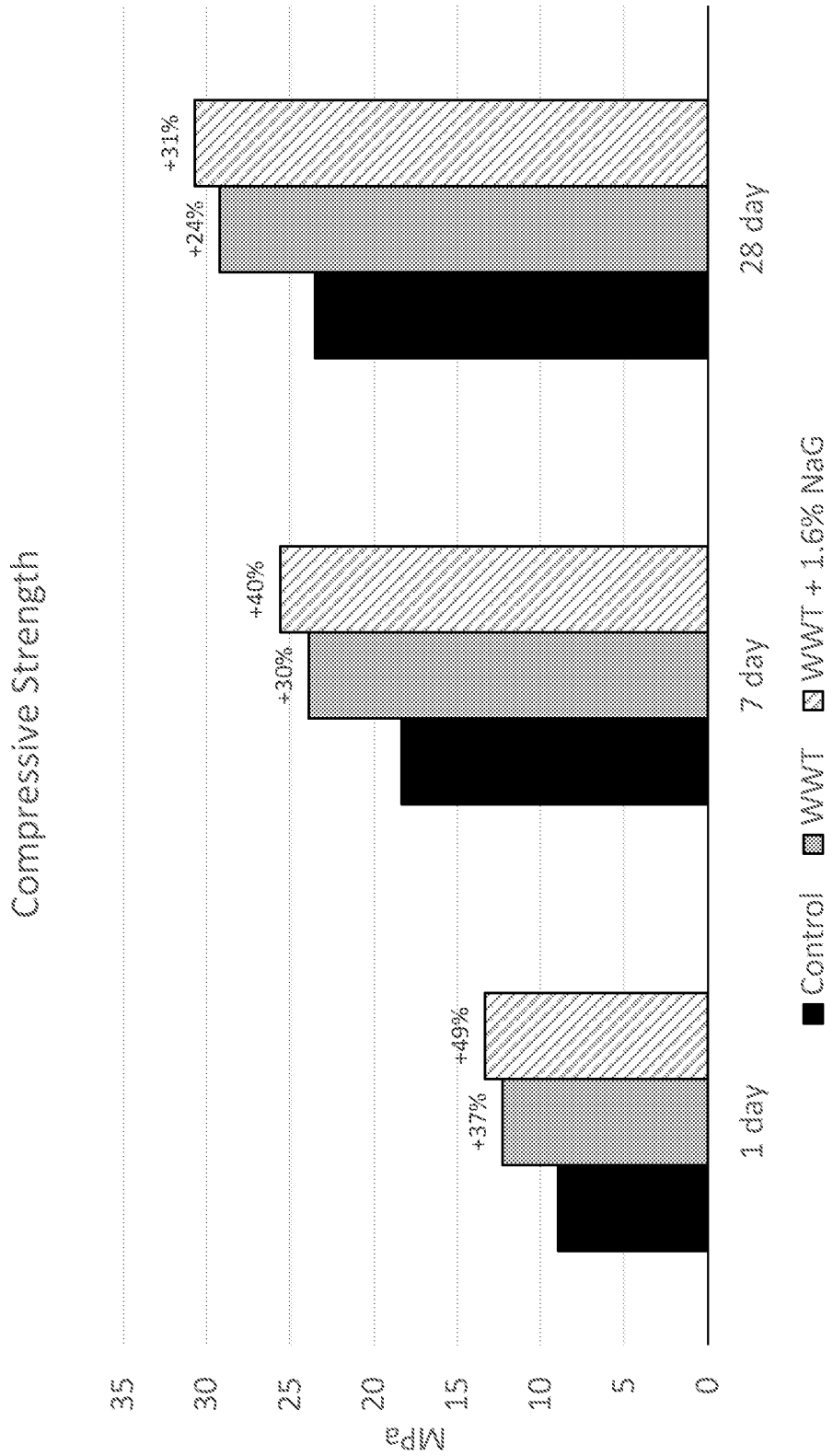

Compressive Strength
MPa
35
30
25
20
15
10
5
0
+31%
+24%
28 day
+40%
+30%
7 day
+49%
+37%
1 day
Control
WWT
WWT + 1.6% NaCl

Figure 38

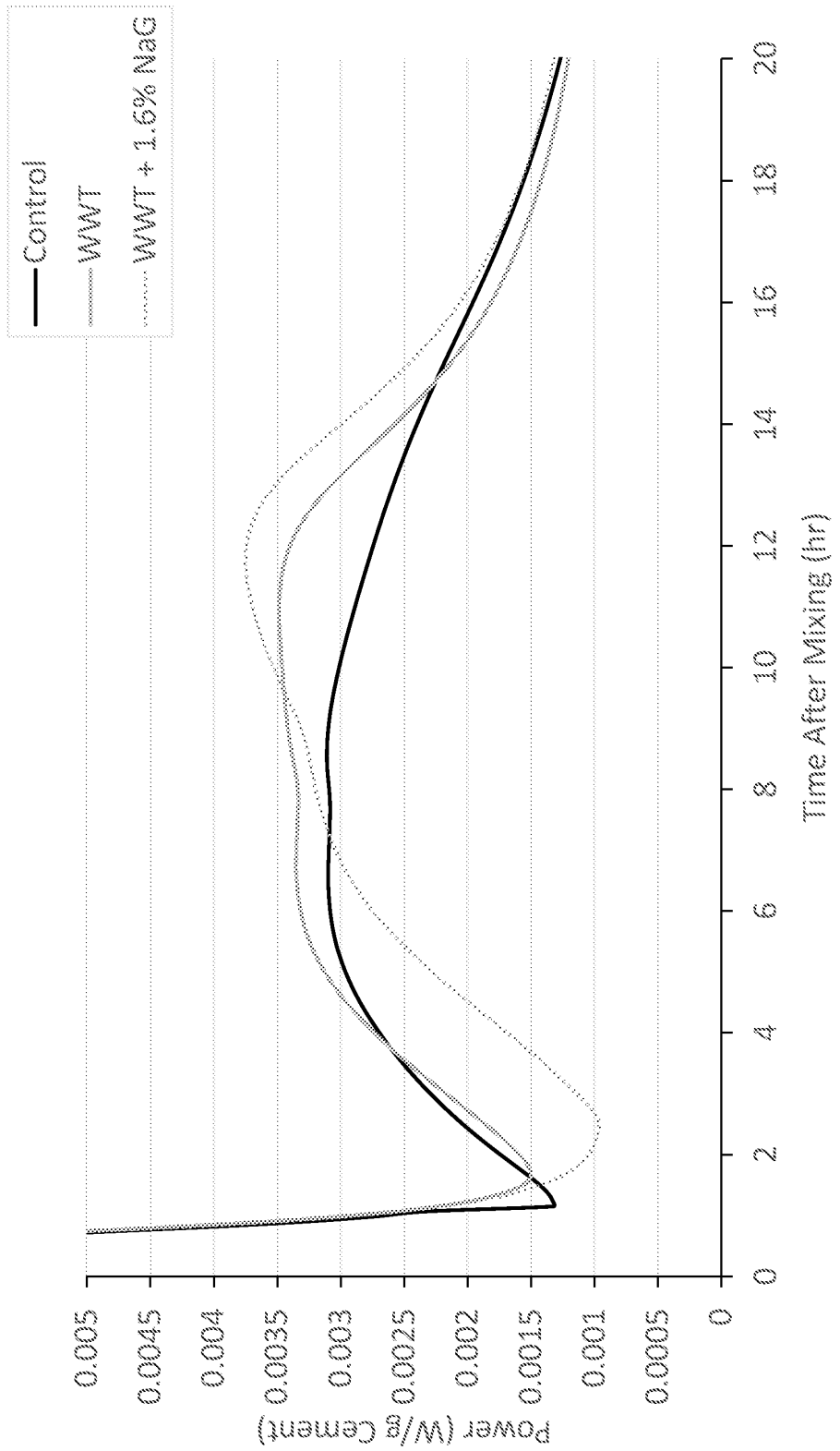

Control
WWT
WWT + 1.6% NaG
Power (W/g Cement)
0.005
0.0045
0.004
0.0035
0.003
0.0025
0.002
0.0015
0.001
0.0005
0
Time After Mixing (hr)
0
2
4
6
8
10
12
14
16
18
20

Figure 39

| Batch ID | Control | WWT | WWT + NaG |
|---|---|---|---|
| Sand Mass (kg) | 19.90 | 19.90 | 19.90 |
| Coarse Agg Mass (kg) | 27.18 | 27.18 | 27.18 |
| Cement Mass (kg) | 6.88 | 6.88 | 6.88 |
| Limestone Filler Mass (kg) | 1.62 | 1.62 | 1.62 |
| Target batch water (kg) | 5.04 | 5.04 | 5.04 |
| Water Mass (kg) | 4.65 | 0.00 | 0.00 |
| WW mass (kg) | 0.00 | 5.36 | 5.36 |
| Washwater Solids (kg) | 0.00 | 0.71 | 0.71 |
| w/c Ratio | 0.59 | 0.55 | 0.55 |
| Volume (m3) | 0.0256 | 0.0258 | 0.0258 |

Figure 40

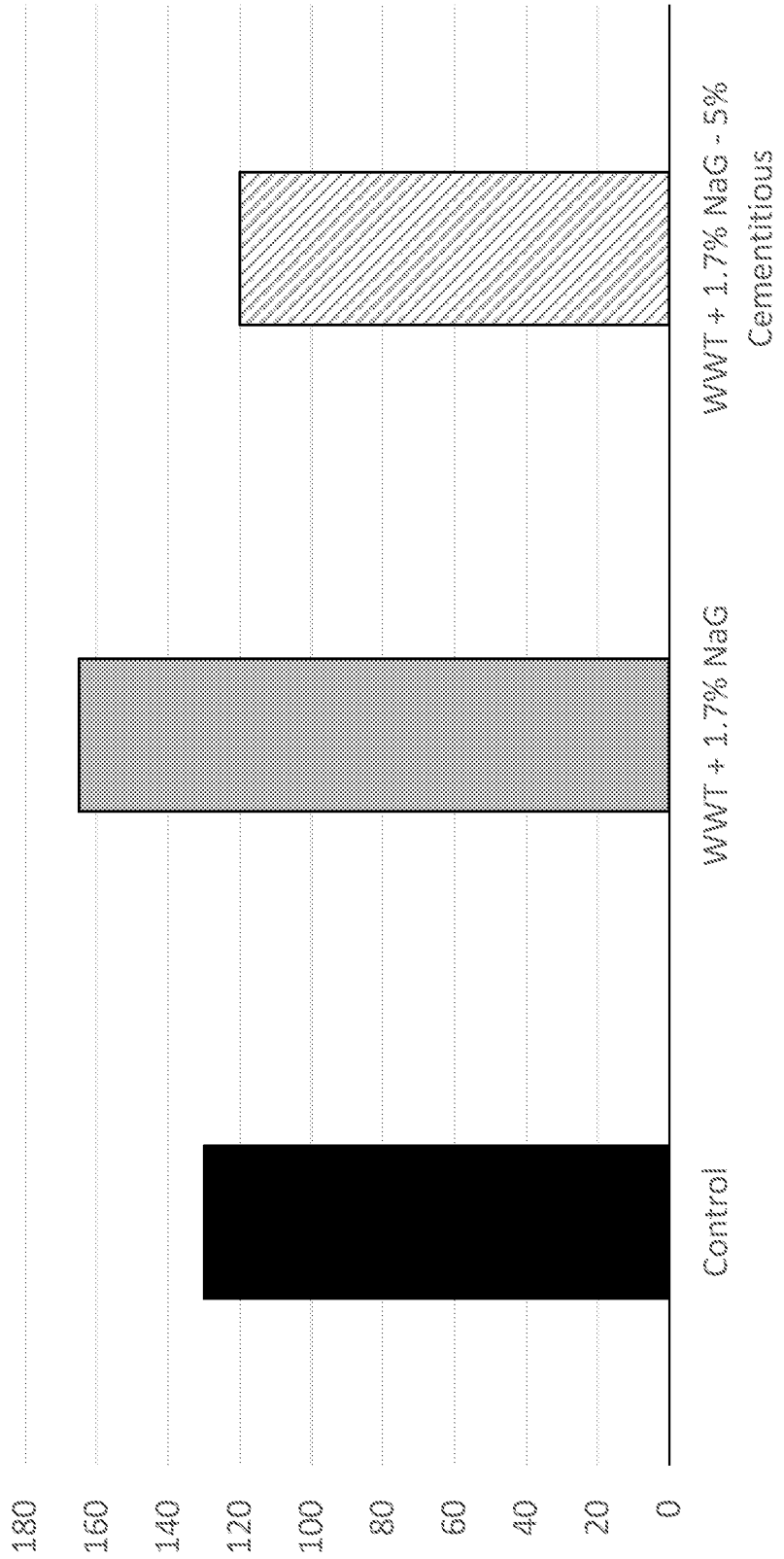

Slump (mm)
180
160
140
120
100
80
60
40
20
0
Control
WWT + 1.7% NaG
WWT + 1.7% NaG - 5% Cementitious

Figure 41

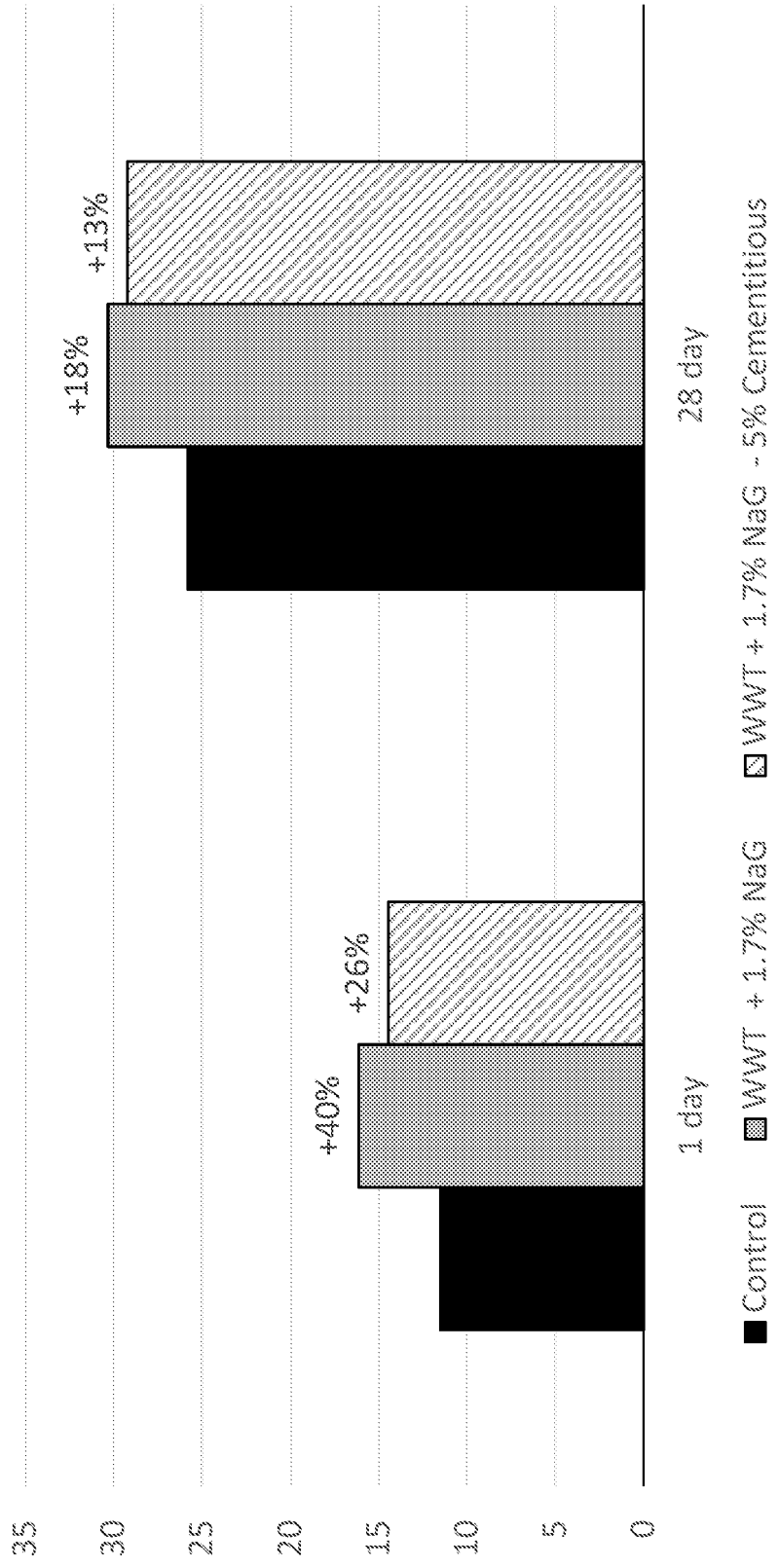

Compressive Strength
35
30
25
20
15
10
5
0
+40%
+26%
+18%
+13%
1 day
28 day
Control
WWT + 1.7% NaG
WWT + 1.7% NaG - 5% Cementitious

Figure 42

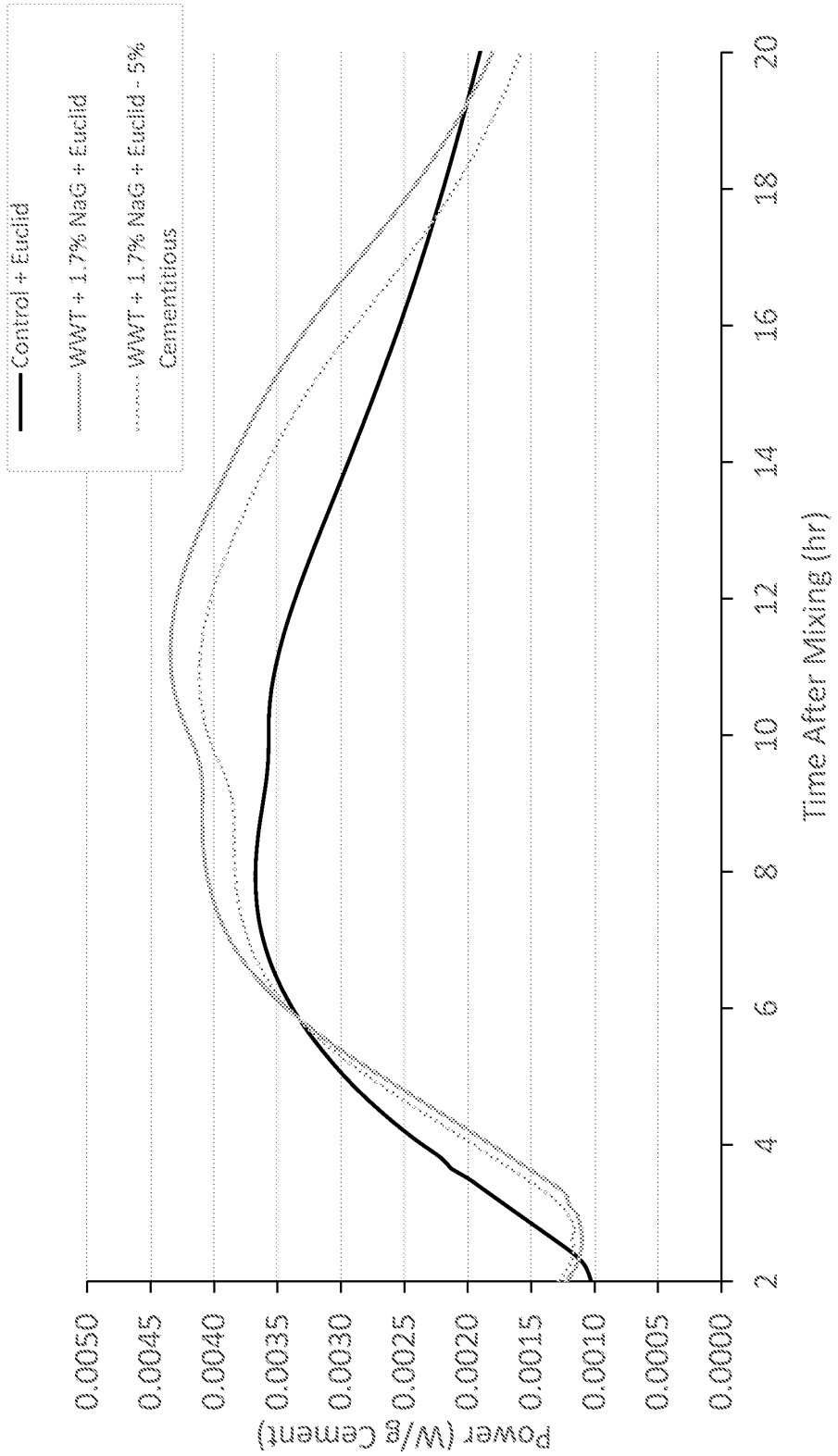

Control + Euclid
WWT + 1.7% NaG + Euclid
WWT + 1.7% NaG + Euclid - 5% Cementitious
Power (W/g Cement)
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
2
4
6
8
10
12
14
16
18
20
Time After Mixing (hr)

Figure 43

| Batch ID | Control | WWT | WWT + NaG |
|---|---|---|---|
| Sand Mass (kg) | 22.90 | 22.90 | 22.90 |
| Coarse Agg Mass (kg) | 25.17 | 25.17 | 25.17 |
| Cement Mass (kg) | 5.71 | 5.71 | 5.42 |
| Limestone Filler Mass (kg) | 1.44 | 1.44 | 1.37 |
| Target batch water (kg) | 3.71 | 3.71 | 3.71 |
| Water Mass (kg) | 3.61 | 0.00 | 0.00 |
| WW mass (kg) | 0.00 | 4.16 | 4.16 |
| Washwater Solids (kg) | 0.00 | 0.55 | 0.55 |
| w/c Ratio | 0.52 | 0.48 | 0.48 |
| Volume (m3) | 0.0246 | 0.0247 | 0.0247 |

Figure 44

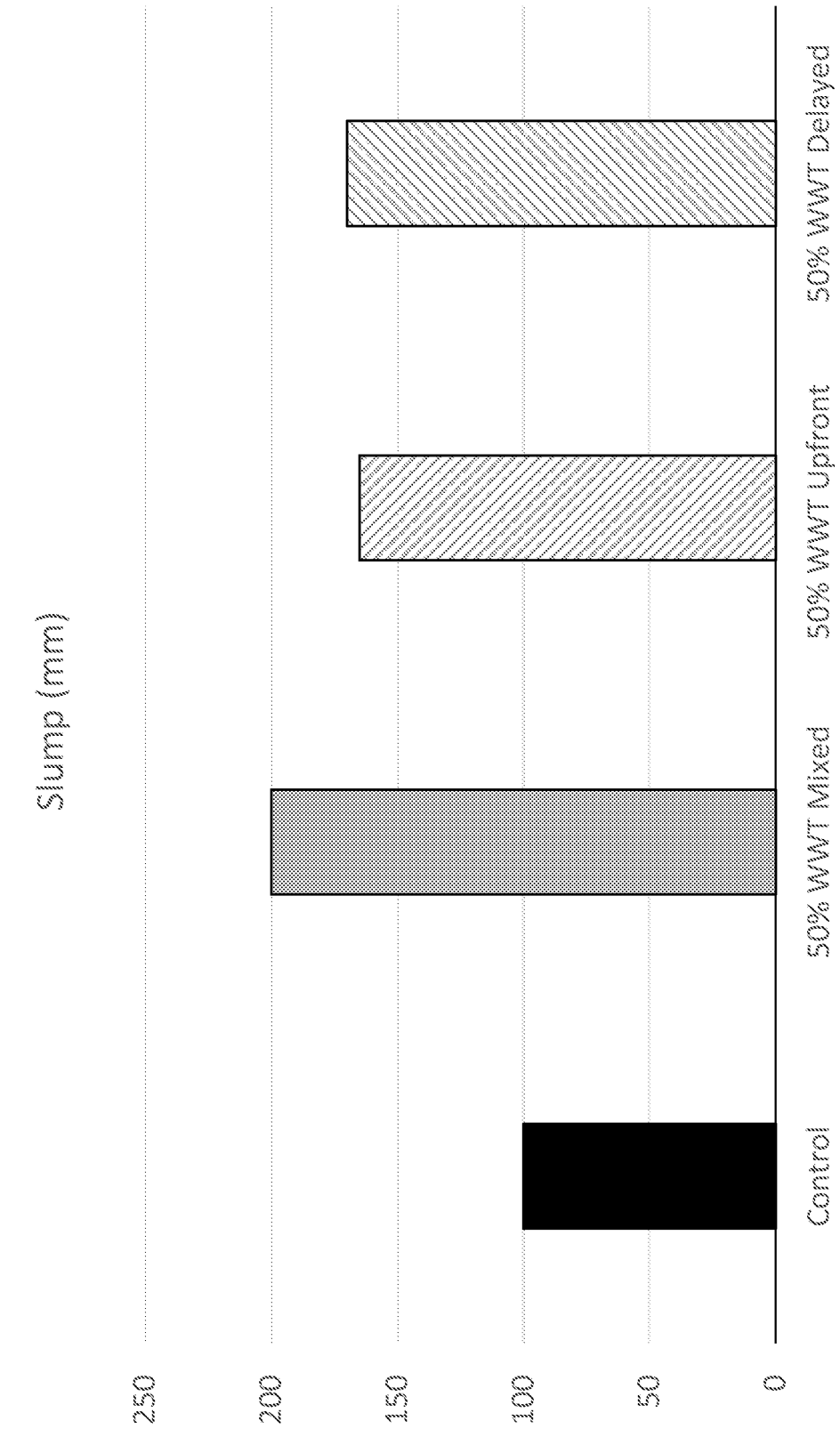

Slump (mm)
250
200
150
100
50
0
Control
50% WWT Mixed
50% WWT Upfront
50% WWT Delayed

Figure 45

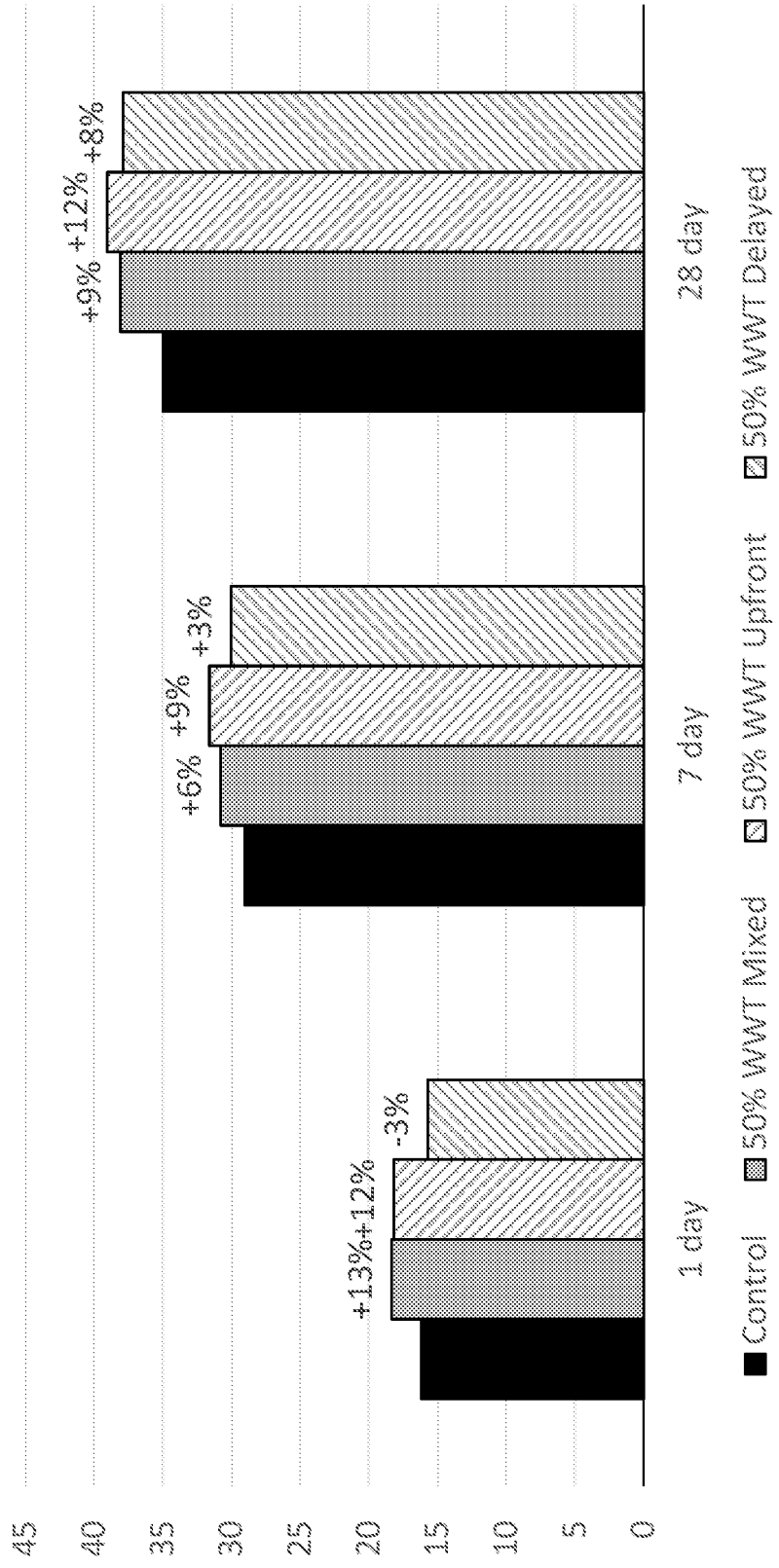

Compressive Strength
45
40
35
30
25
20
15
10
5
0
+13%
+12%
-3%
+6%
+9%
+3%
+9%
+12%
+8%
1 day
7 day
28 day
Control
50% WWT Mixed
50% WWT Upfront
50% WWT Delayed

Figure 46

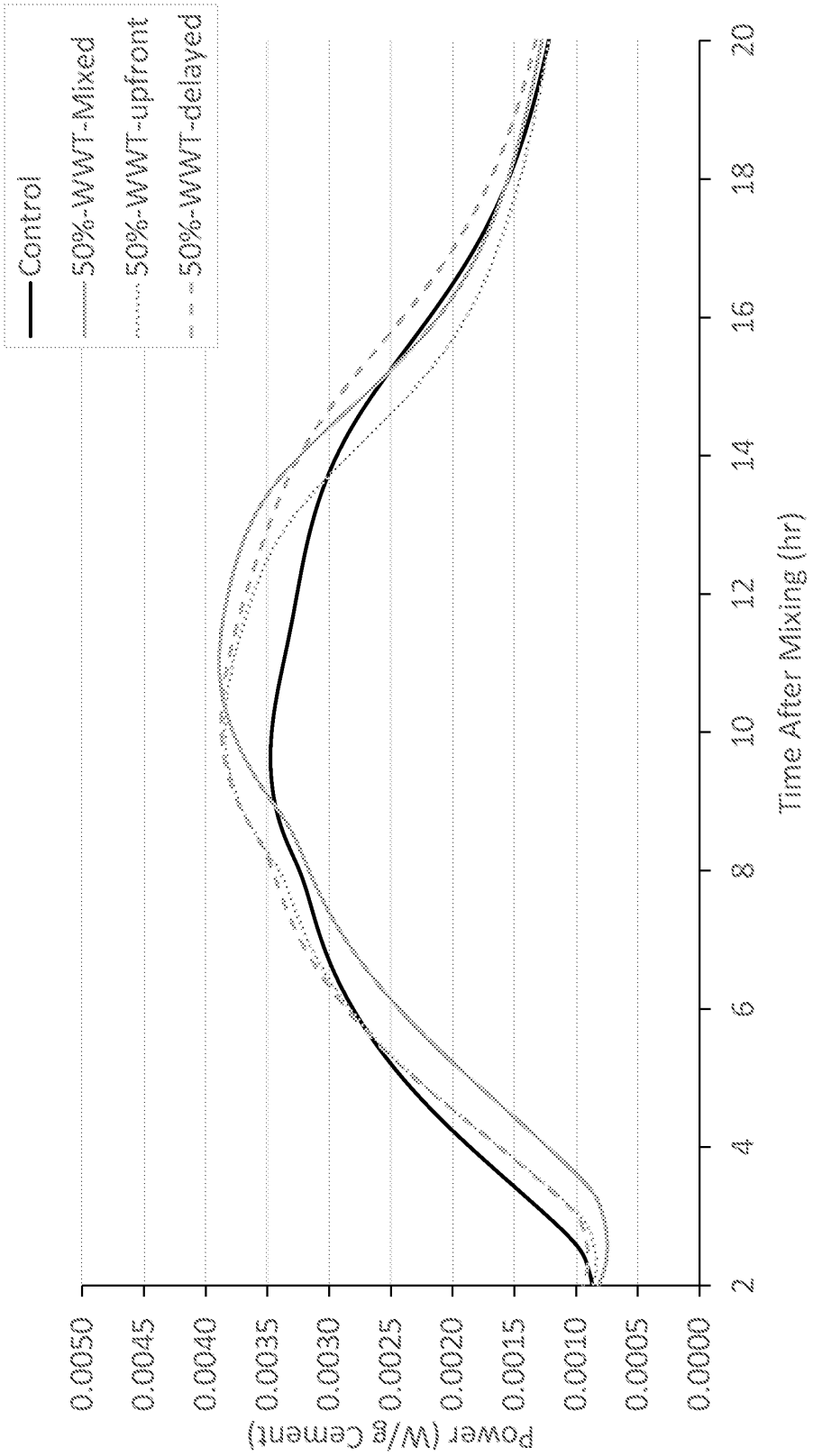

Control
50%-WWT-Mixed
50%-WWT-upfront
50%-WWT-delayed
Power (W/g Cement)
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
Time After Mixing (hr)
2
4
6
8
10
12
14
16
18
20

Figure 47

| Batch ID | Control | WWT Mixed | WWT Upfront | WWT Delayed |
|---|---|---|---|---|
| Sand Mass (kg) | 22.90 | 22.90 | 22.90 | 22.90 |
| Coarse Agg Mass (kg) | 27.18 | 27.18 | 27.18 | 27.18 |
| Cement Mass (kg) | 6.88 | 6.88 | 6.88 | 6.88 |
| Limestone Filler Mass (kg) | 1.72 | 1.72 | 1.72 | 1.72 |
| Target batch water (kg) | 3.87 | 3.87 | 3.87 | 3.87 |
| Water Mass (kg) | 3.58 | 1.79 | 1.79 | 1.79 |
| WW mass (kg) | 0.00 | 2.07 | 2.07 | 2.07 |
| Washwater Solids (kg) | 0.00 | 0.28 | 0.28 | 0.28 |
| w/c Ratio | 0.45 | 0.44 | 0.44 | 0.44 |
| Volume (m3) | 0.0257 | 0.0257 | 0.0257 | 0.0257 |

Figure 48

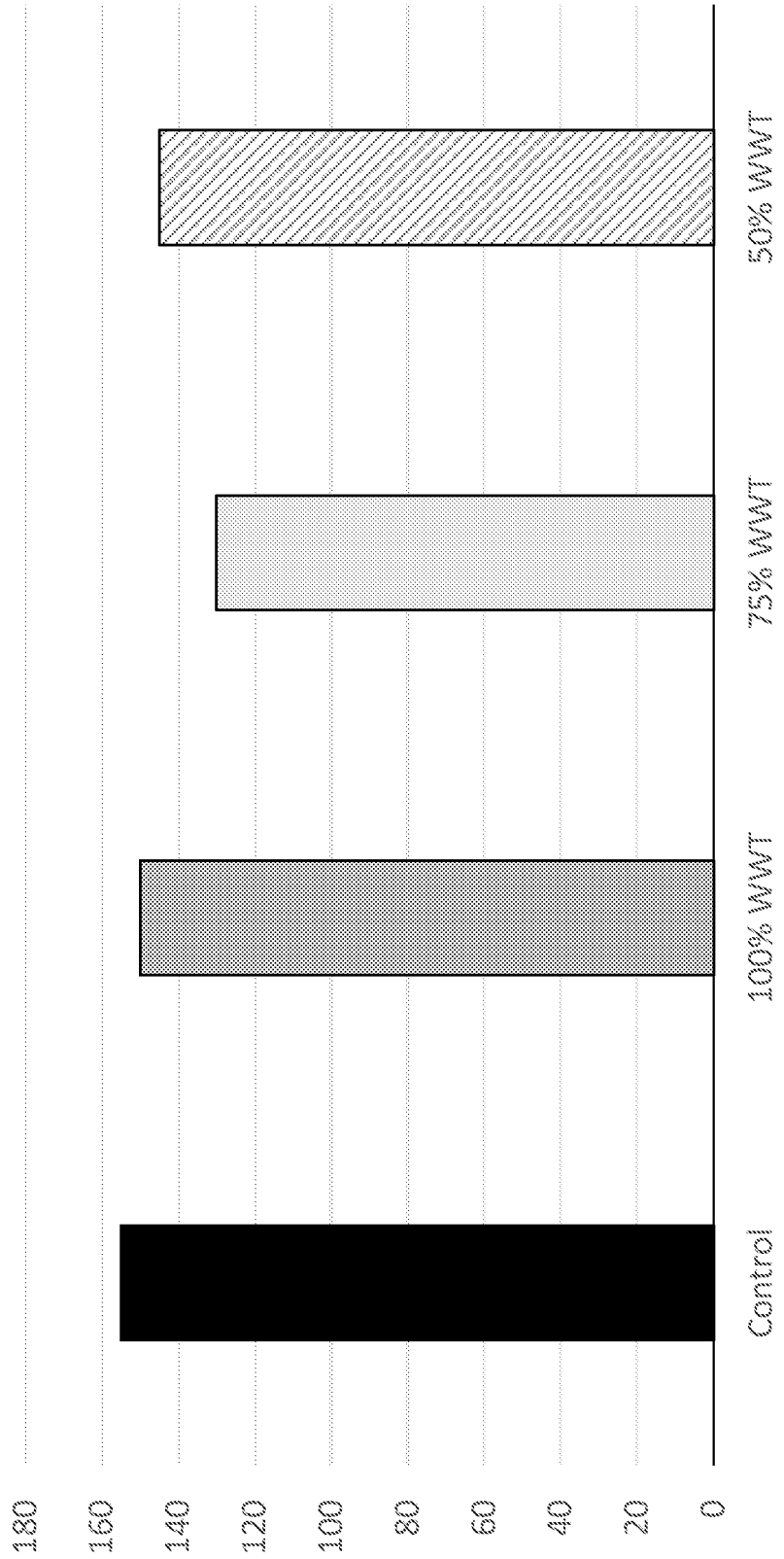

Slump (mm)
180
160
140
120
100
80
60
40
20
0
Control
100% WWT
75% WWT
50% WWT

Figure 49

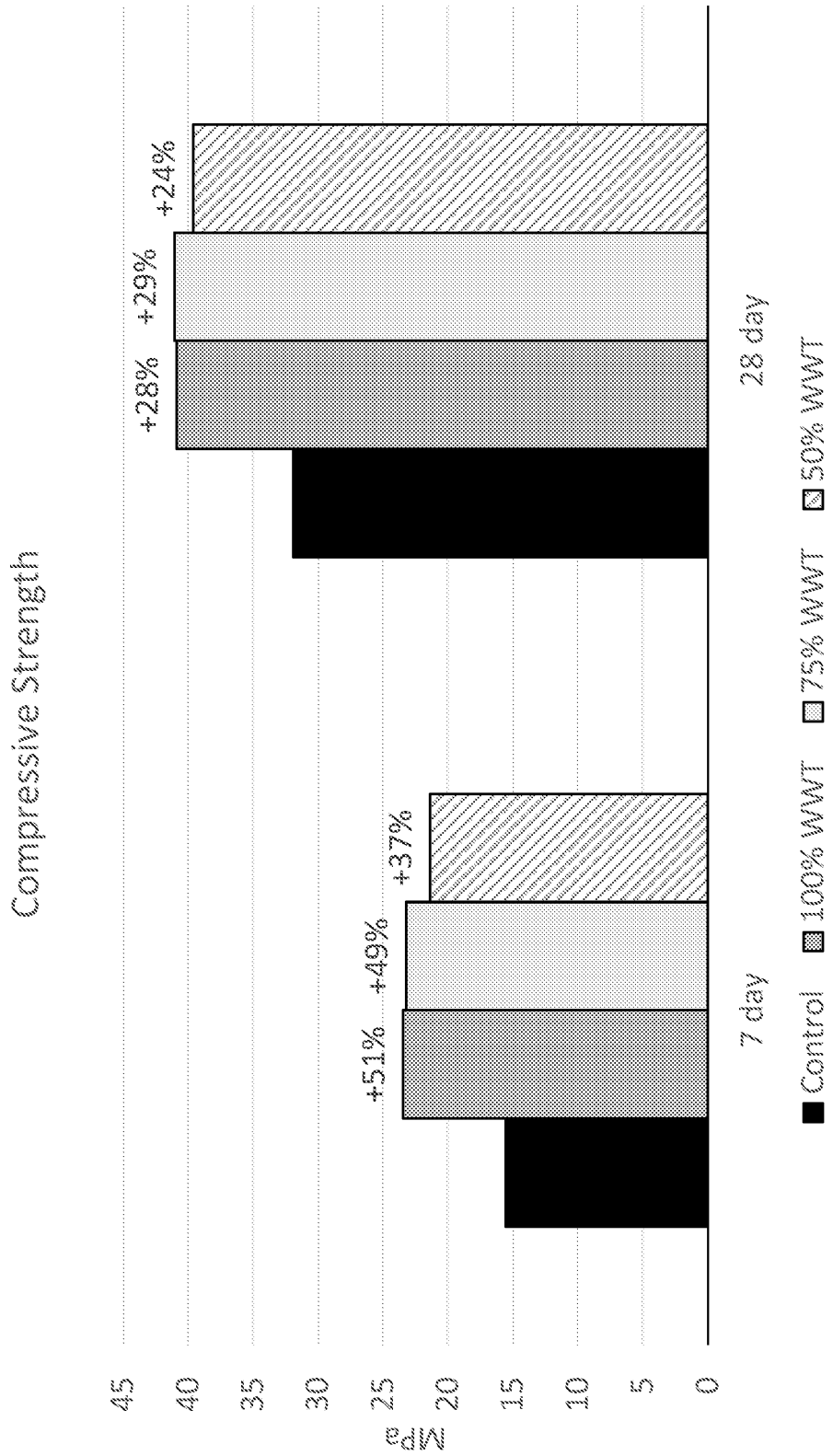

Compressive Strength
MPa
45
40
35
30
25
20
15
10
5
0
+51%
+49%
+37%
+28%
+29%
+24%
7 day
28 day
Control
100% WWT
75% WWT
50% WWT

Figure 50

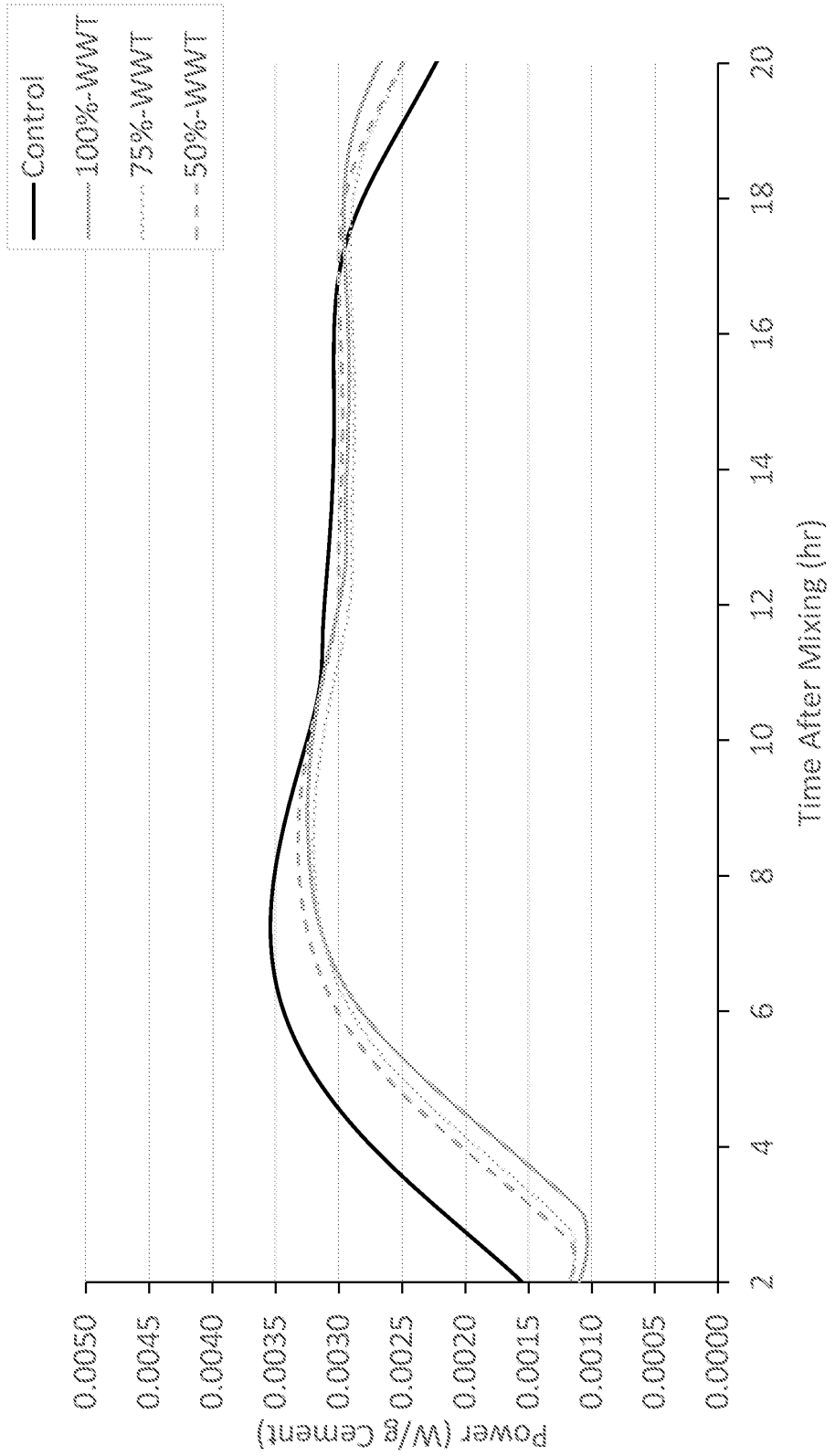

Control
100%-WWT
75%-WWT
50%-WWT
Power (W/g Cement)
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
Time After Mixing (hr)
2
4
6
8
10
12
14
16
18
20

Figure 51

| Batch ID | Control | WWT 100% | WWT 75% | WWT 50% |
|---|---|---|---|---|
| Sand Mass (kg) | 20.63 | 20.63 | 20.63 | 20.63 |
| Coarse Agg Mass (kg) | 27.00 | 27.00 | 27.00 | 27.00 |
| Cement Mass (kg) | 3.91 | 3.91 | 3.91 | 3.91 |
| Fly Ash Mass (kg) | 2.25 | 2.25 | 2.25 | 2.25 |
| Slag Mass (kg) | 1.65 | 1.65 | 1.65 | 1.65 |
| Target batch water (kg) | 4.26 | 4.26 | 4.26 | 4.26 |
| Water Mass (kg) | 3.26 | 0.00 | 0.82 | 1.63 |
| WW mass (kg) | 0.00 | 3.50 | 2.62 | 1.75 |
| Washwater Solids (kg) | 0.00 | 0.24 | 0.18 | 0.12 |
| w/c Ratio | 0.55 | 0.53 | 0.53 | 0.54 |
| Volume (m3) | 0.0257 | 0.0258 | 0.0258 | 0.0257 |

Figure 52

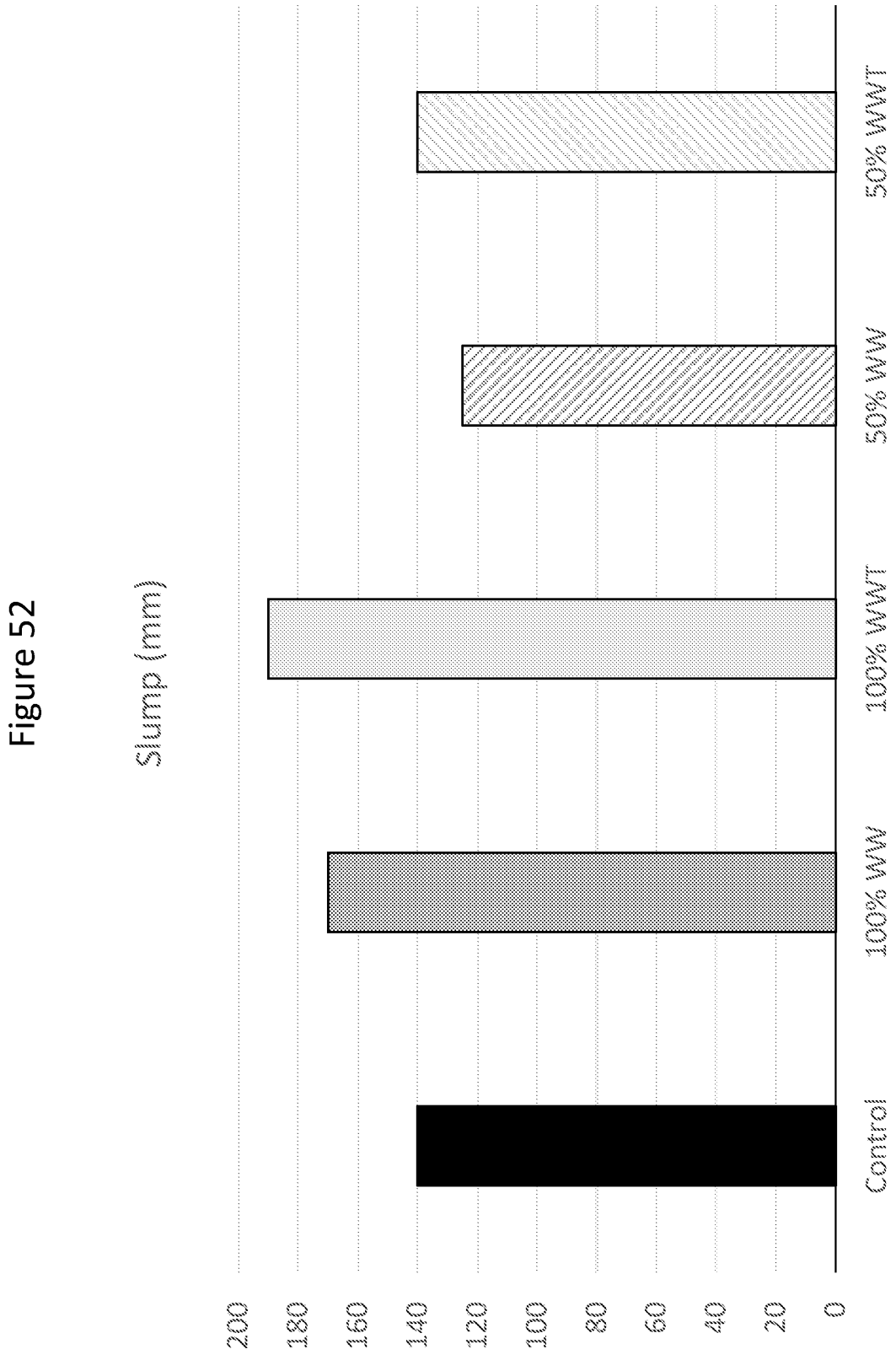

Slump (mm)
200
180
160
140
120
100
80
60
40
20
0
Control
100% WW
100% WWT
50% WW
50% WWT

Figure 53

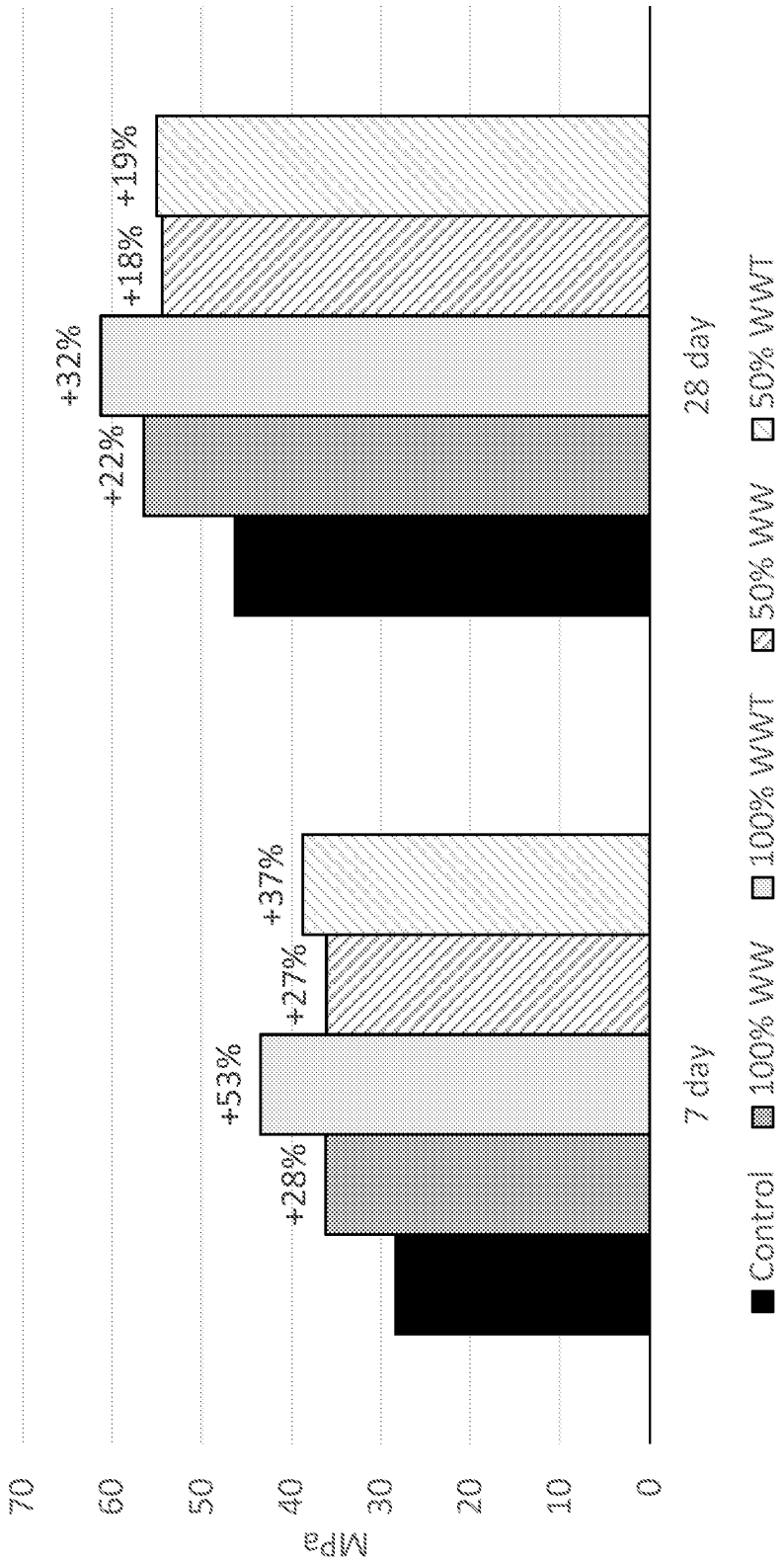

Compressive Strength
MPa
70
60
50
40
30
20
10
0
+32%
+22%
+18%
+19%
+53%
+28%
+37%
+27%
28 day
7 day
Control
100% WW
100% WWT
50% WW
50% WWT

Figure 54

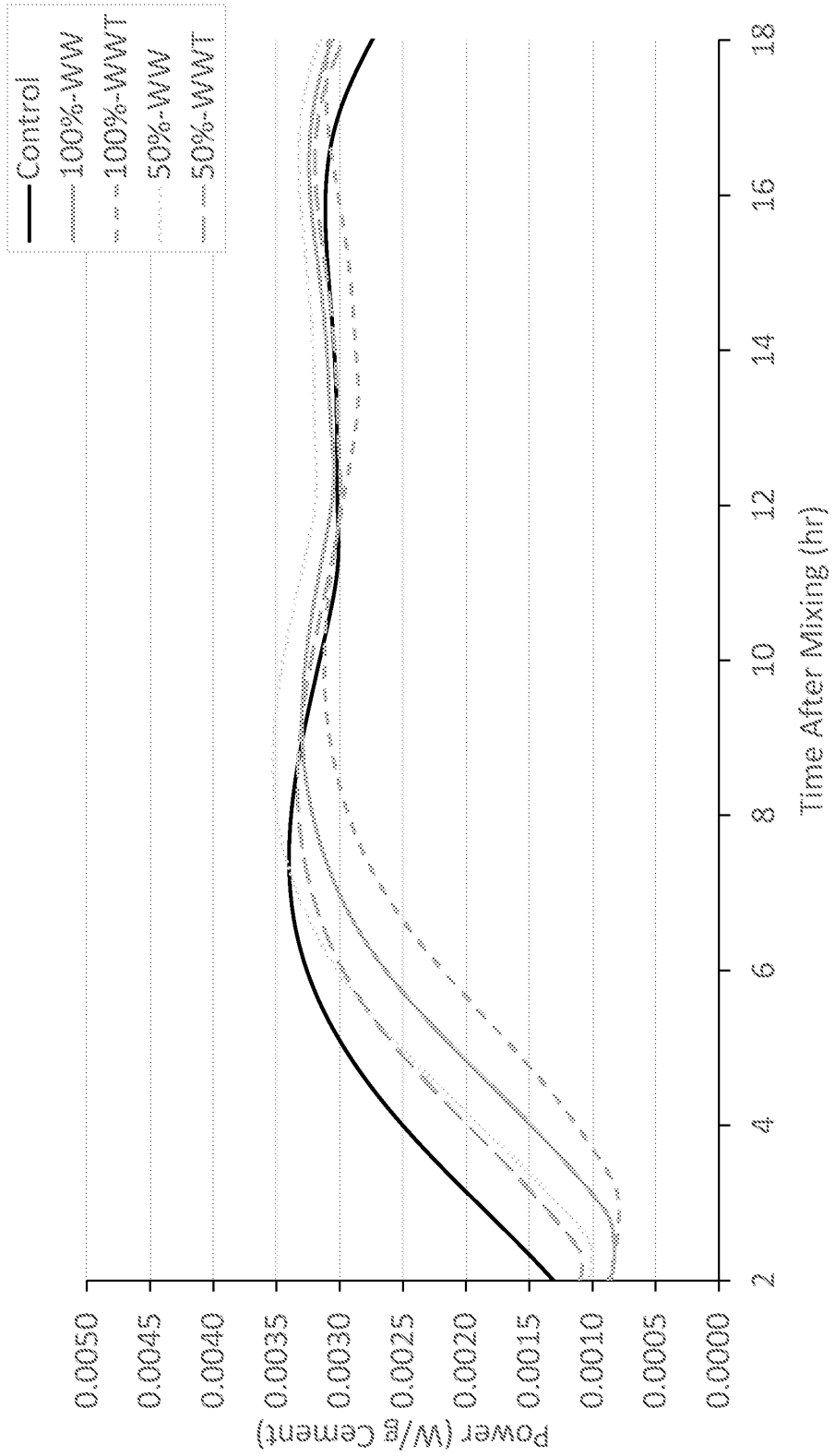

Control
100%-WW
100%-WWT
50%-WW
50%-WWT
Power (W/g Cement)
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
2
4
6
8
10
12
14
16
18
Time After Mixing (hr)

Figure 55

| Batch ID | Control | WW 100% | WWT 100% | WW 50% | WWT 50% |
|---|---|---|---|---|---|
| Sand Mass (kg) | 19.35 | 19.35 | 19.35 | 19.35 | 19.35 |
| Coarse Agg Mass (kg) | 26.00 | 26.00 | 26.00 | 26.00 | 26.00 |
| Cement Mass (kg) | 4.50 | 4.50 | 4.50 | 4.50 | 4.50 |
| Fly Ash Mass (kg) | 1.86 | 1.86 | 1.86 | 1.86 | 1.86 |
| Slag Mass (kg) | 2.64 | 2.64 | 2.64 | 2.64 | 2.64 |
| Target batch water (kg) | 4.05 | 4.05 | 4.05 | 4.05 | 4.05 |
| Water Mass (kg) | 3.10 | 0.00 | 0.00 | 1.55 | 1.55 |
| WW mass (kg) | 0.00 | 3.33 | 3.33 | 1.67 | 1.67 |
| Washwater Solids (kg) | 0.00 | 0.23 | 0.23 | 0.12 | 0.12 |
| w/c Ratio | 0.45 | 0.44 | 0.44 | 0.44 | 0.44 |
| Volume (m3) | 0.0256 | 0.0257 | 0.0257 | 0.0256 | 0.0256 |

Figure 56

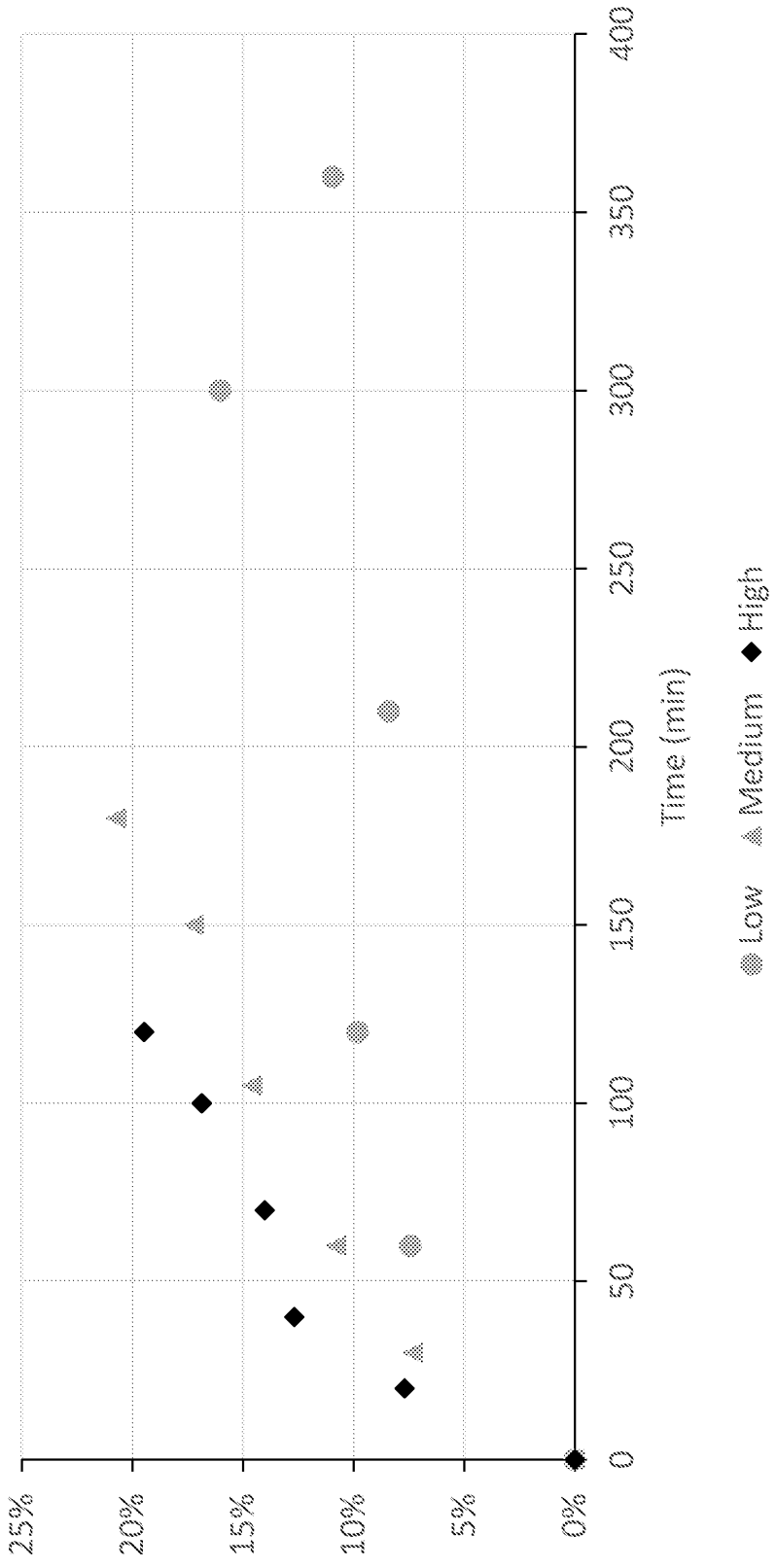

%CO2 bwc
25%
20%
15%
10%
5%
0%
0
50
100
150
200
250
300
350
400
Time (min)
Low
Medium
High

Figure 57

| | 7 day compressive strength relative to a control | | | | |
|---|---|---|---|---|---|
| Flow | 0 | 7-8 | 10-13 | 14-15 | 16-17 | 19-21 |
| Low | 110% | 99% | 98% | 97% | 98% | 80% |
| Med | 99% | 67% | 107% | 109% | 106% | 107% |
| High | 108% | 97% | 96% | 95% | 88% | 97% |

Figure 58

| | Mortar slump relative to a control | | | | | |
|---|---|---|---|---|---|---|
| Flow | 0 | 7-8 | 10-13 | 14-15 | 16-17 | 19-21 |
| Low | 150% | 40% | 0% | 0% | 0% | 0% |
| Med | 170% | 130% | 64% | 10% | 0% | 0% |
| High | 164% | 100% | 35% | 0% | 0% | 0% |

Figure 59

| | Mortar calorimeter setting time relative to a control | | | | | |
|---|---|---|---|---|---|---|
| Flow | 0 | 7-8 | 10-13 | 14-15 | 16-17 | 19-21 |
| Low | 129% | 98% | 53% | 29% | 51% | 56% |
| Med | 129% | 119% | 111% | 79% | 89% | 89% |
| High | 153% | 140% | 103% | 67% | 62% | 70% |

Figure 60

| | Mortar calorimeter peak energy output relative to a control | | | | |
|---|---|---|---|---|---|
| Flow | 0 | 7-8 | 10-13 | 14-15 | 16-17 | 19-21 |
| Low | 99% | 103% | 93% | 95% | 95% | 89% |
| Med | 97% | 103% | 97% | 94% | 93% | 90% |
| High | 97% | 101% | 108% | 101% | 92% | 97% |

Figure 61

| | Washwater temperature (°C) | | | | |
|---|---|---|---|---|---|
| Flow | 0 | 7-8 | 10-13 | 14-15 | 16-17 | 19-21 |
| Low | 22.1 | 30.7 | 37.8 | 41.5 | 40 | 38.8 |
| Med | 21.8 | 28.8 | 34.8 | 40 | 41.7 | 41.6 |
| High | 23 | 30.9 | 33.4 | 43.7 | 47.5 | 48.4 |

Figure 62

| | Washwater pH | | | | |
|---|---|---|---|---|---|
| Flow | 0 | 7-8 | 10-13 | 14-15 | 16-17 | 19-21 |
| Low | 12.7 | 11.5 | 12.1 | 11.6 | 10.6 | 9.9 |
| Med | 12.8 | 11.7 | 11.7 | 10.9 | 9.4 | 7.8 |
| High | 12.8 | 11.2 | 11.2 | 10.8 | 9.5 | 8.2 |

Figure 63

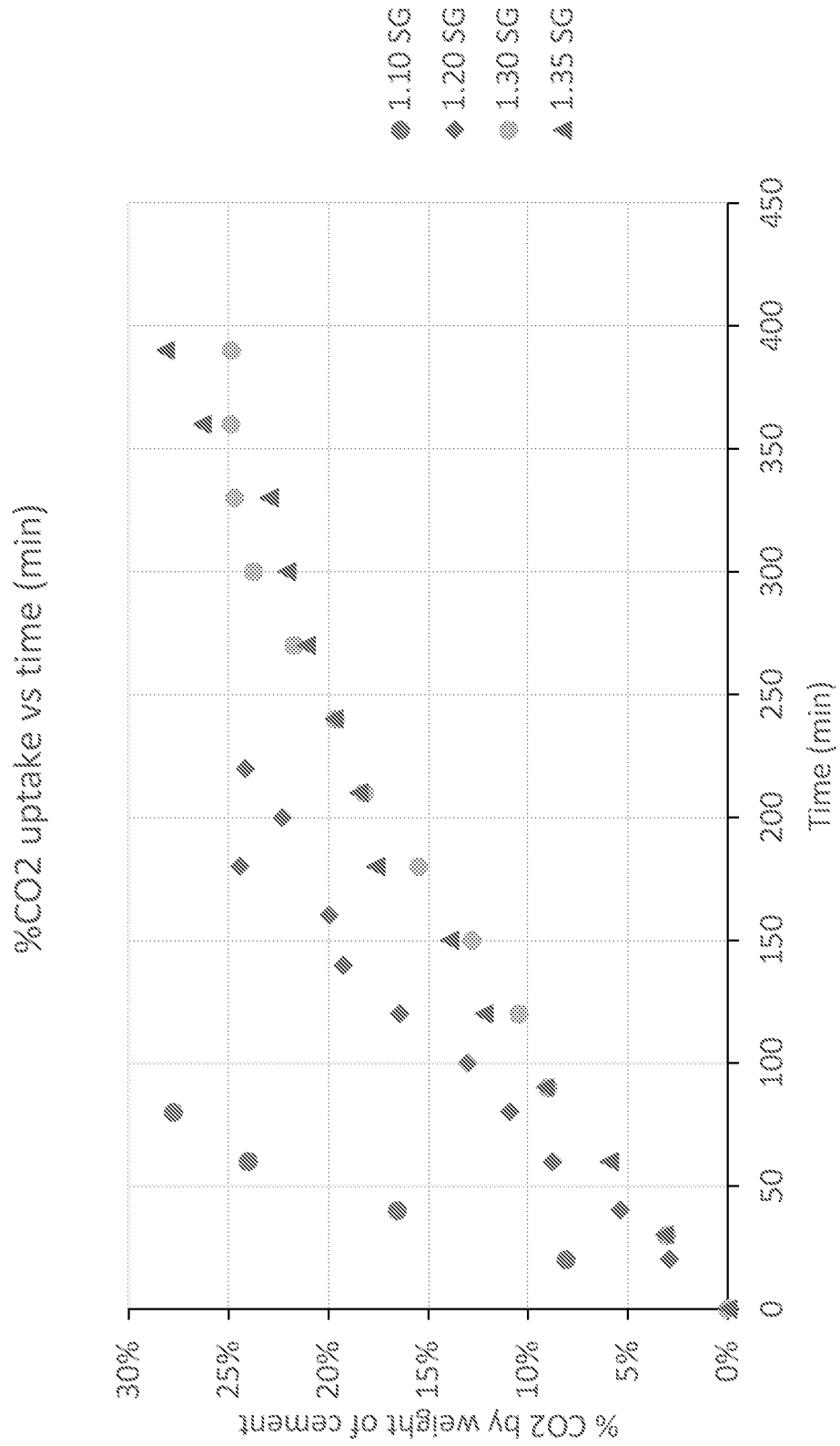

%CO2 uptake vs time (min)
1.10 SG
1.20 SG
1.30 SG
1.35 SG
% CO2 by weight of cement
30%
25%
20%
15%
10%
5%
0%
0
50
100
150
200
250
300
350
400
450
Time (min)

Figure 64

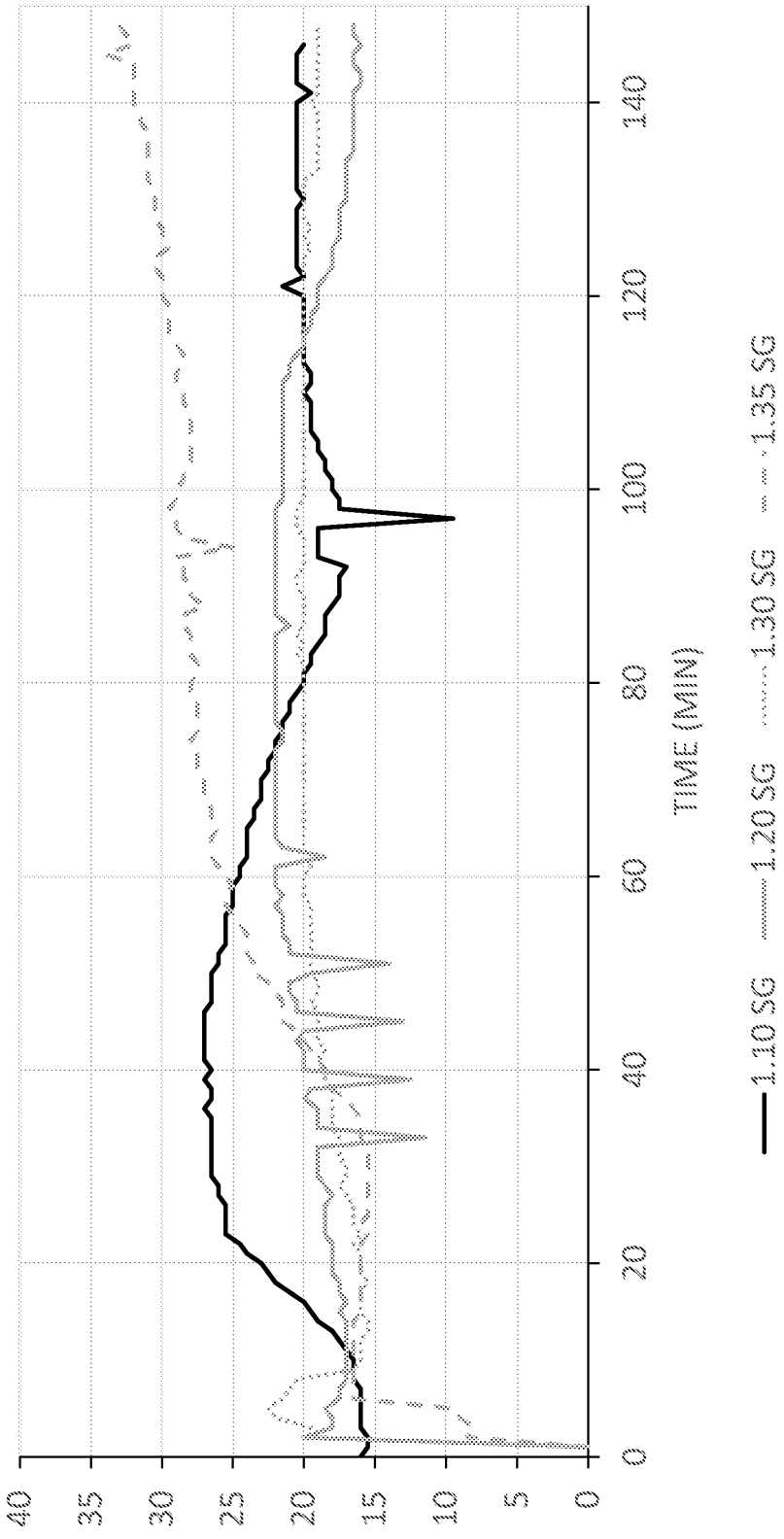

TEMPERATURE (°C)
0
5
10
15
20
25
30
35
40
0
20
40
60
80
100
120
140
TIME (MIN)
1.10 SG
1.20 SG
1.30 SG
1.35 SG

Figure 65

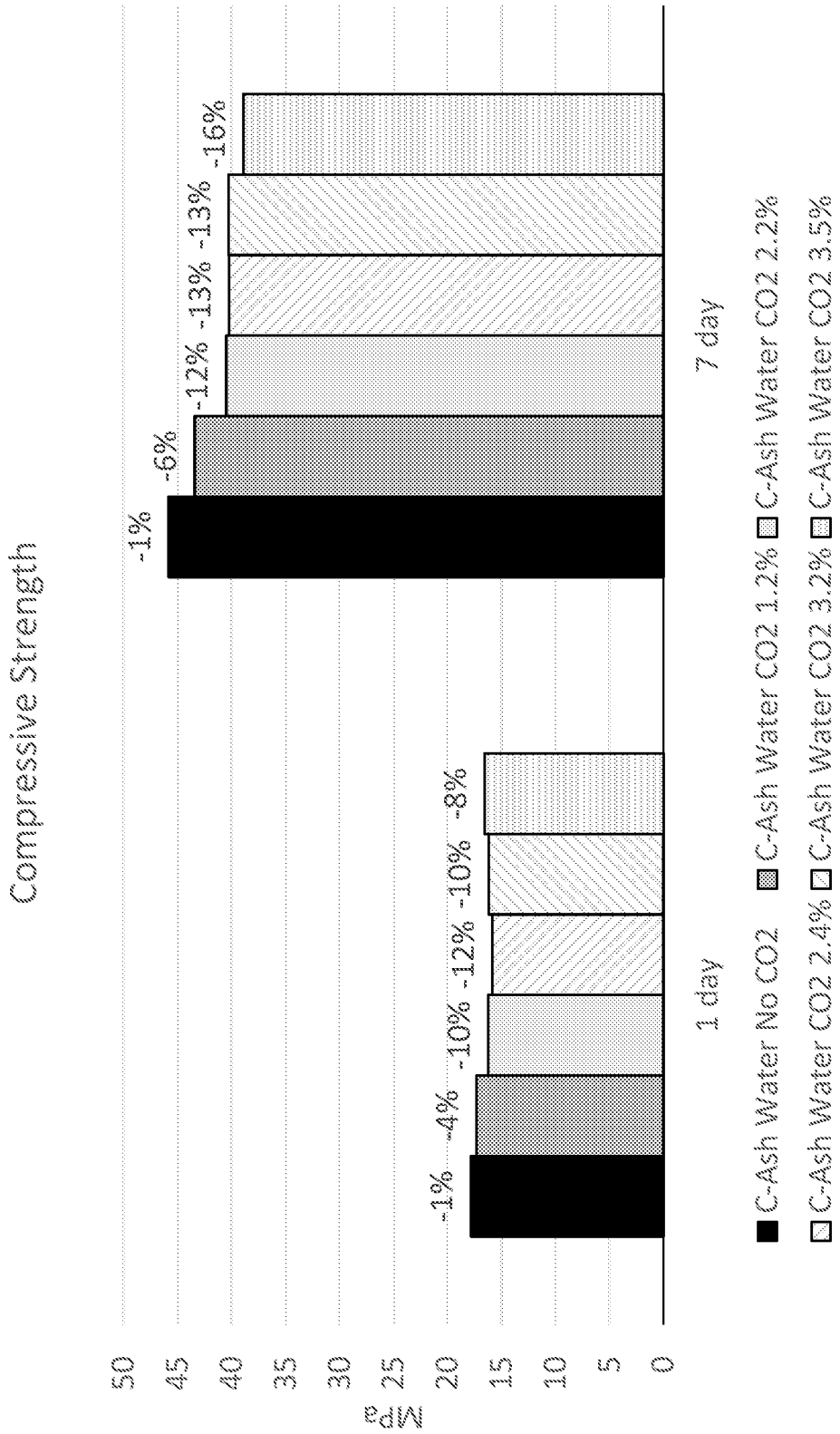
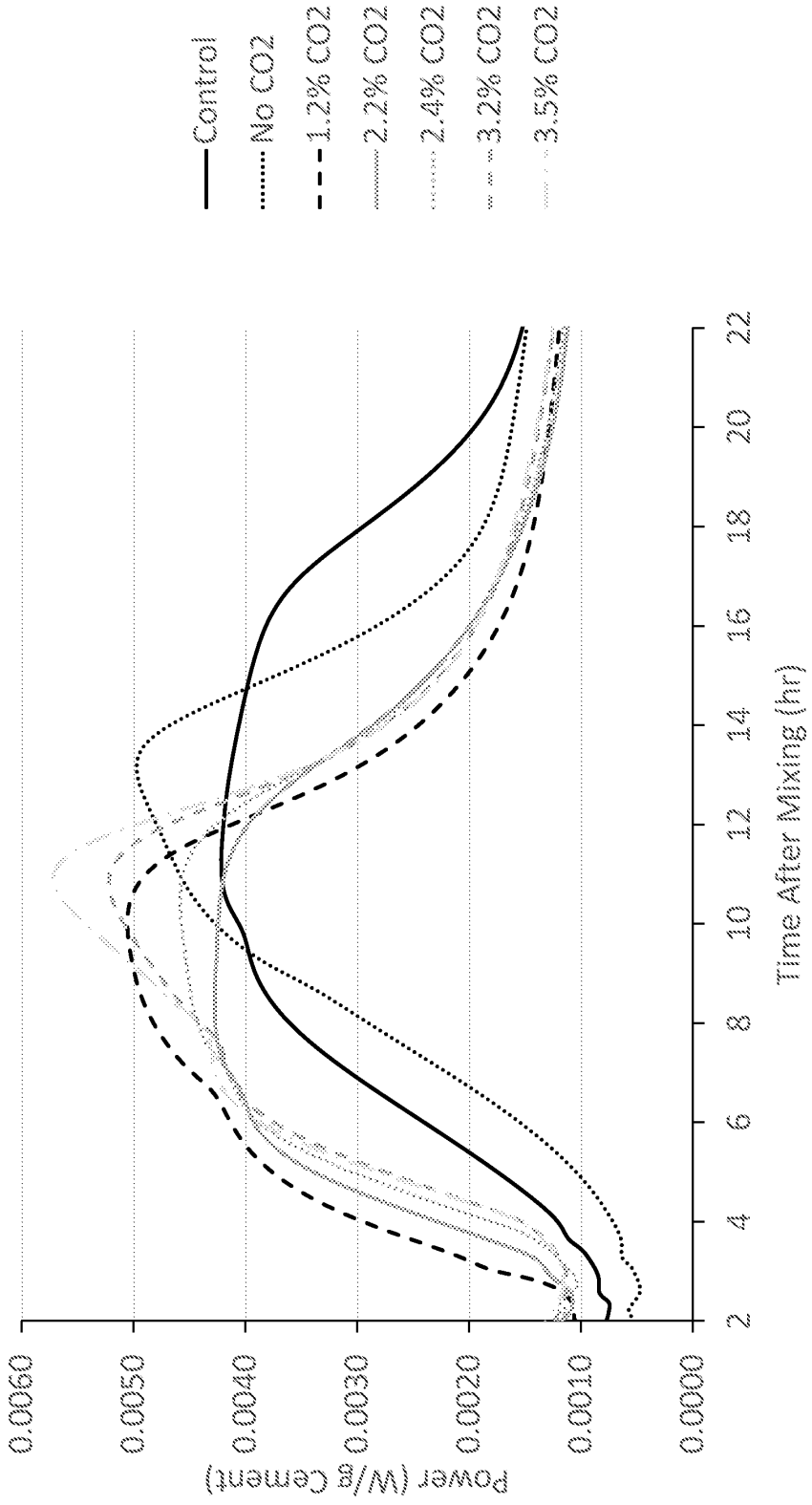

Compressive Strength
MPa
50
45
40
35
30
25
20
15
10
5
0
-1%
-4%
-10%
-12%
-10%
-8%
-1%
-6%
-12%
-13%
-13%
-16%
1 day
7 day
C-Ash Water No CO2
C-Ash Water CO2 1.2%
C-Ash Water CO2 2.2%
C-Ash Water CO2 2.4%
C-Ash Water CO2 3.2%
C-Ash Water CO2 3.5%

Figure 66


Control
No CO2
1.2% CO2
2.2% CO2
2.4% CO2
3.2% CO2
3.5% CO2
Power (W/g Cement)
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
Time After Mixing (hr)
2
4
6
8
10
12
14
16
18
20
22

# Figure 67

| Batch ID | Control | No CO2 | 1.2% CO2 | 2.2% CO2 | 2.4% CO2 | 3.2% CO2 | 3.5% CO2 |
|---|---|---|---|---|---|---|---|
| Sand Mass (g) | 1350 | 1350 | 1350 | 1350 | 1350 | 1350 | 1350 |
| Cement Mass (g) | 345 | 345 | 345 | 345 | 345 | 345 | 345 |
| Class C Fly Ash Mass (g) | 146 | 0 | 0 | 0 | 0 | 0 | 0 |
| Water Mass (g) | 245.5 | 0 | 0 | 0 | 0 | 0 | 0 |
| WW Mass (g) | 0 | 390 | 390 | 390 | 390 | 390 | 390 |
| WW Solids Mass (g) | 0 | 146 | 146 | 146 | 146 | 146 | 146 |
| w/c Ratio | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

Figure 68

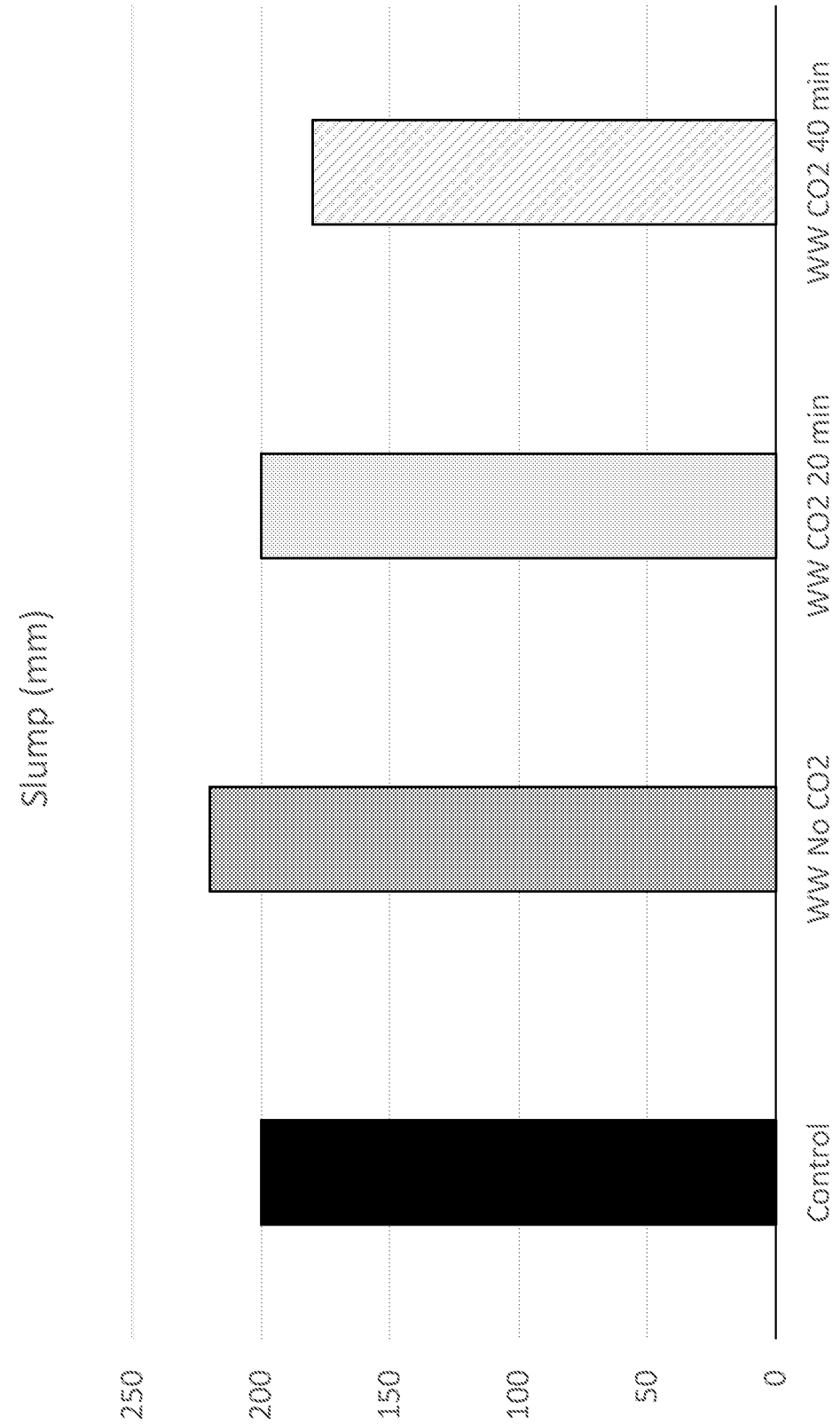

Slump (mm)
250
200
150
100
50
0
Control
WW No CO2
WW CO2 20 min
WW CO2 40 min

Figure 69

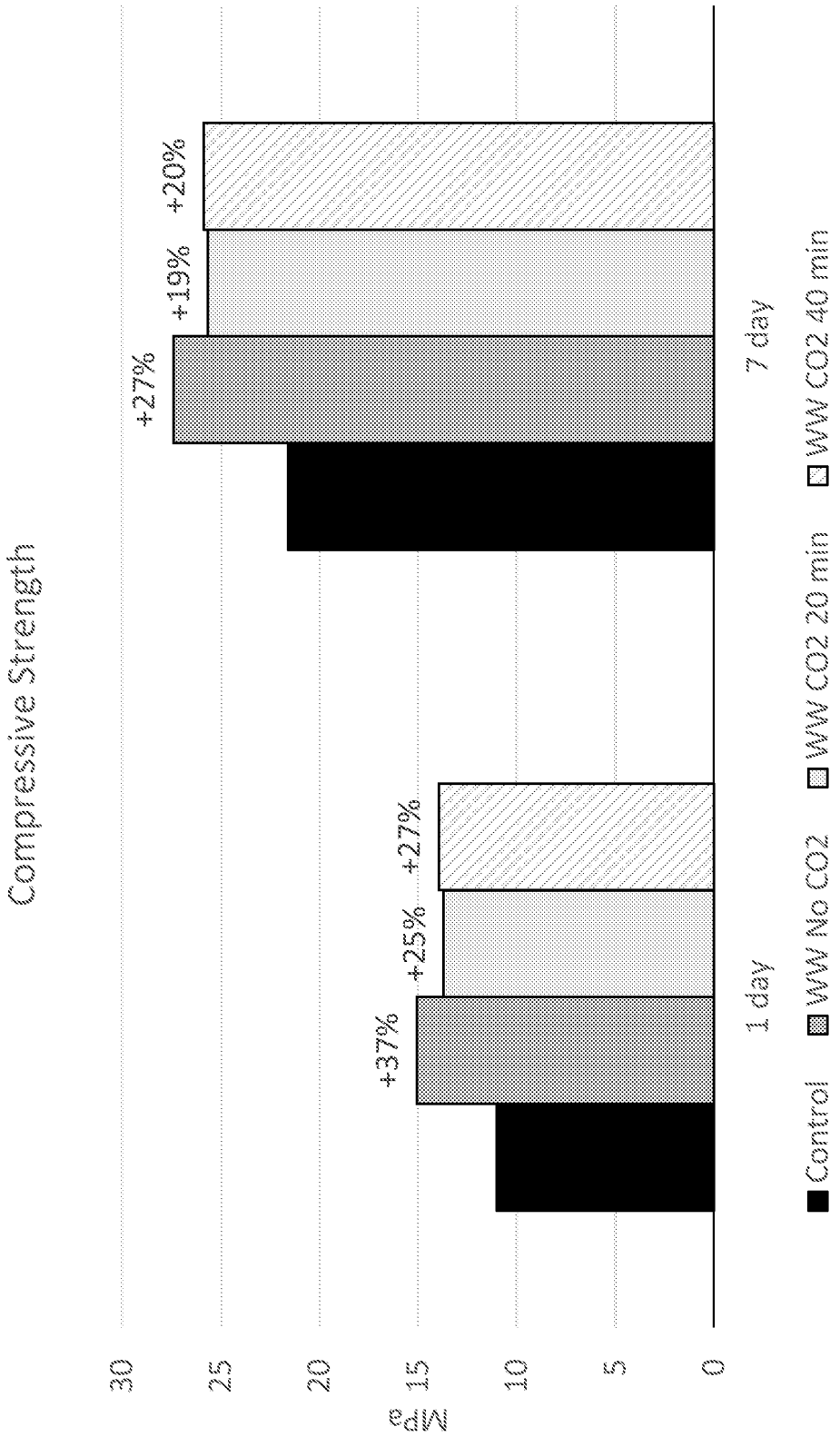

Compressive Strength
MPa
30
25
20
15
10
5
0
+37%
+25%
+27%
+27%
+19%
+20%
1 day
7 day
Control
WW No CO2
WW CO2 20 min
WW CO2 40 min

Figure 70

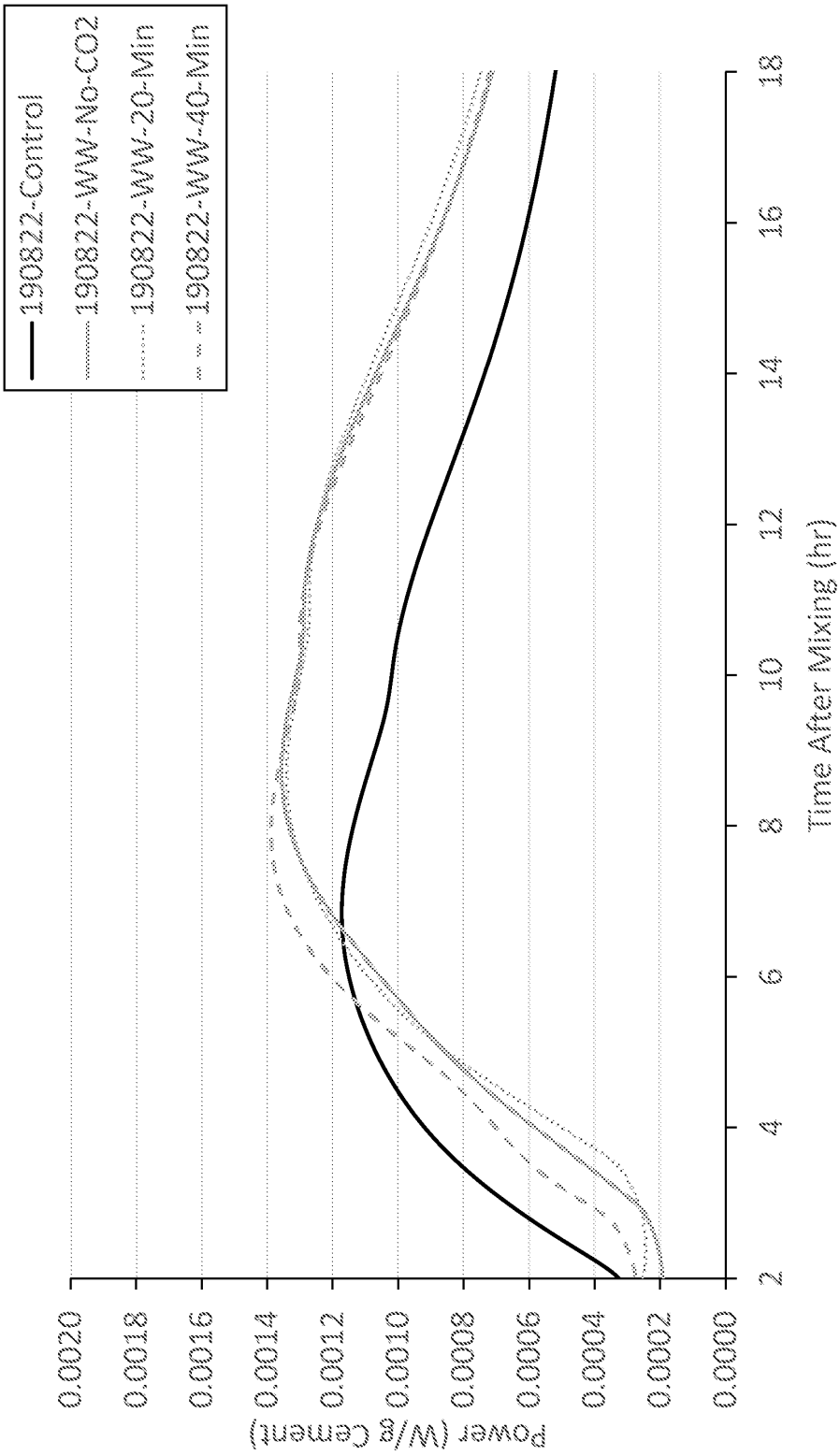

190822-Control
190822-WW-No-CO2
190822-WW-20-Min
190822-WW-40-Min
Power (W/g Cement)
0.00020
0.00018
0.00016
0.00014
0.00012
0.00010
0.00008
0.00006
0.00004
0.00002
0.00000
Time After Mixing (hr)
2
4
6
8
10
12
14
16
18

Figure 71

| Batch ID | Control | No CO2 | 20 min CO2 | 40 min CO2 |
|---|---|---|---|---|
| Sand Mass (kg) | 16.50 | 16.50 | 16.50 | 16.50 |
| Coarse Aggregate Mass (kg) | 23.85 | 23.85 | 23.85 | 23.85 |
| Cement Mass (kg) | 6.82 | 6.82 | 6.82 | 6.82 |
| Water Mass (kg) | 4.09 | 0 | 0 | 0 |
| WW Mass (kg) | 0 | 4.72 | 4.72 | 4.72 |
| WW Solids Mass (kg) | 0 | 0.63 | 0.63 | 0.63 |
| w/c Ratio | 0.63 | 0.57 | 0.57 | 0.57 |
| Volume (m3) | 0.0218 | 0.0218 | 0.0218 | 0.0218 |

Figure 72

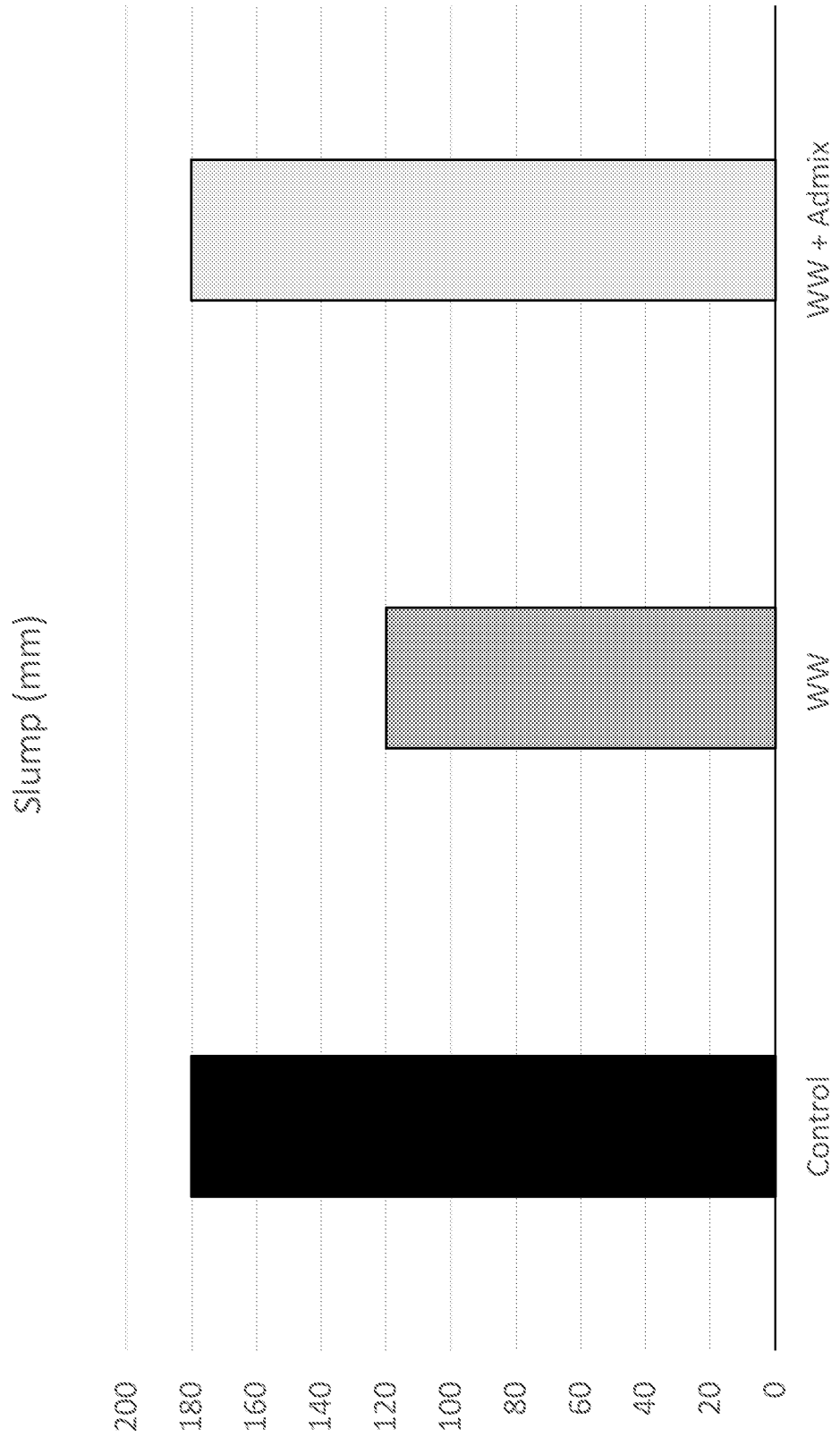

Slump (mm)
200
180
160
140
120
100
80
60
40
20
0
Control
WW
WW + Admix

Figure 73

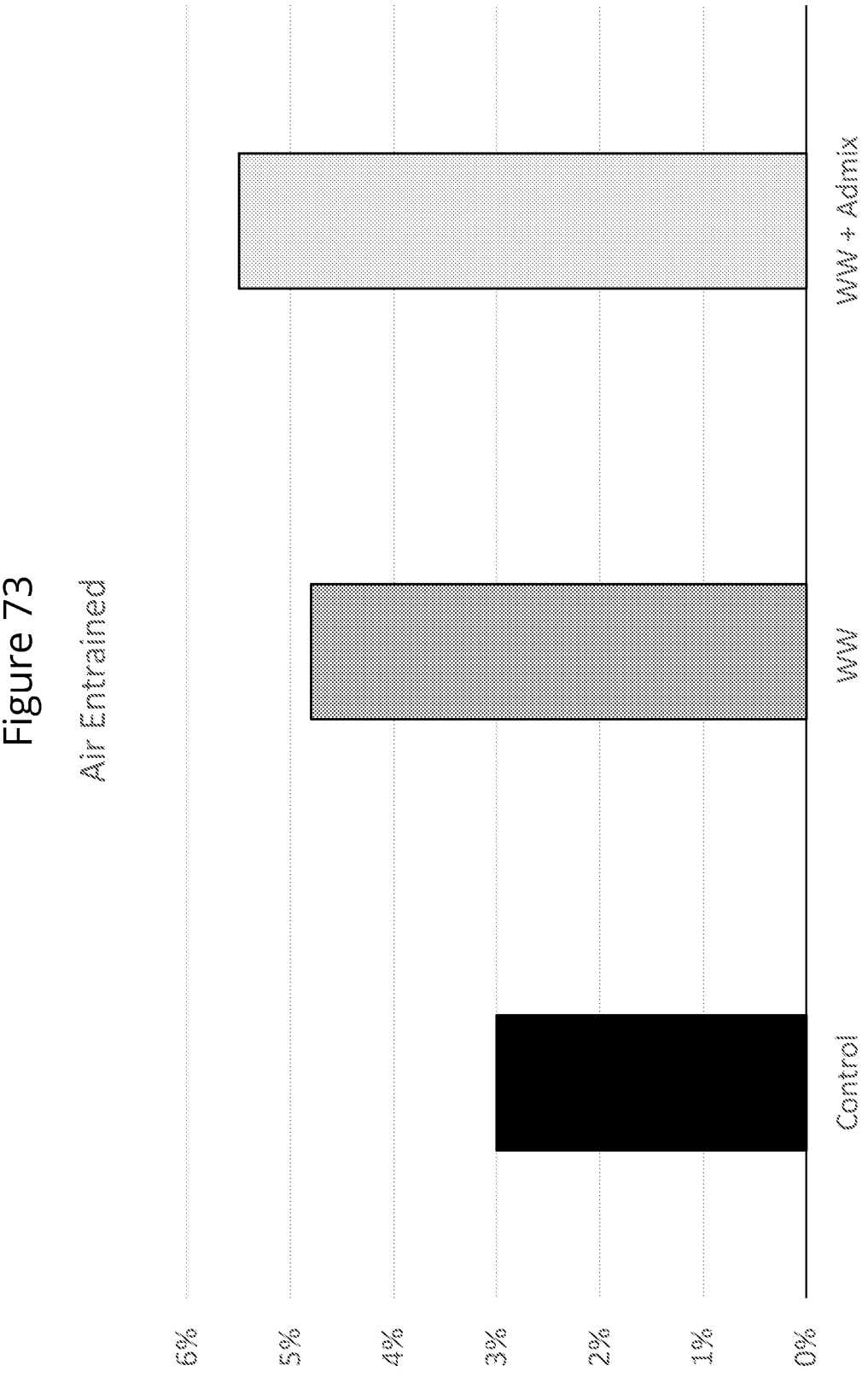


Figure 74

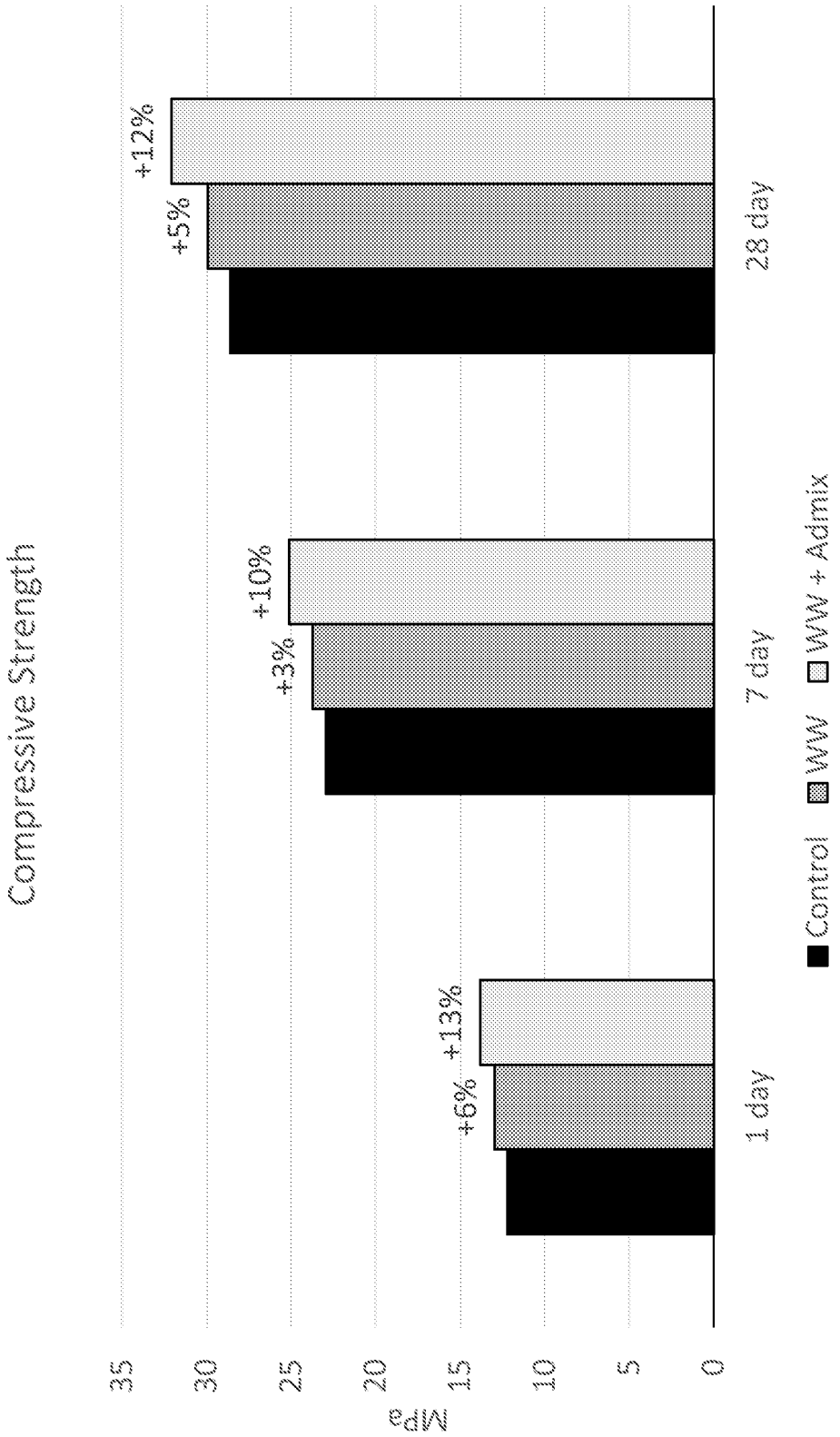

Compressive Strength
MPa
35
30
25
20
15
10
5
0
+12%
+5%
+10%
+3%
+13%
+6%
28 day
7 day
1 day
Control
WW
WW + Admix

Figure 75

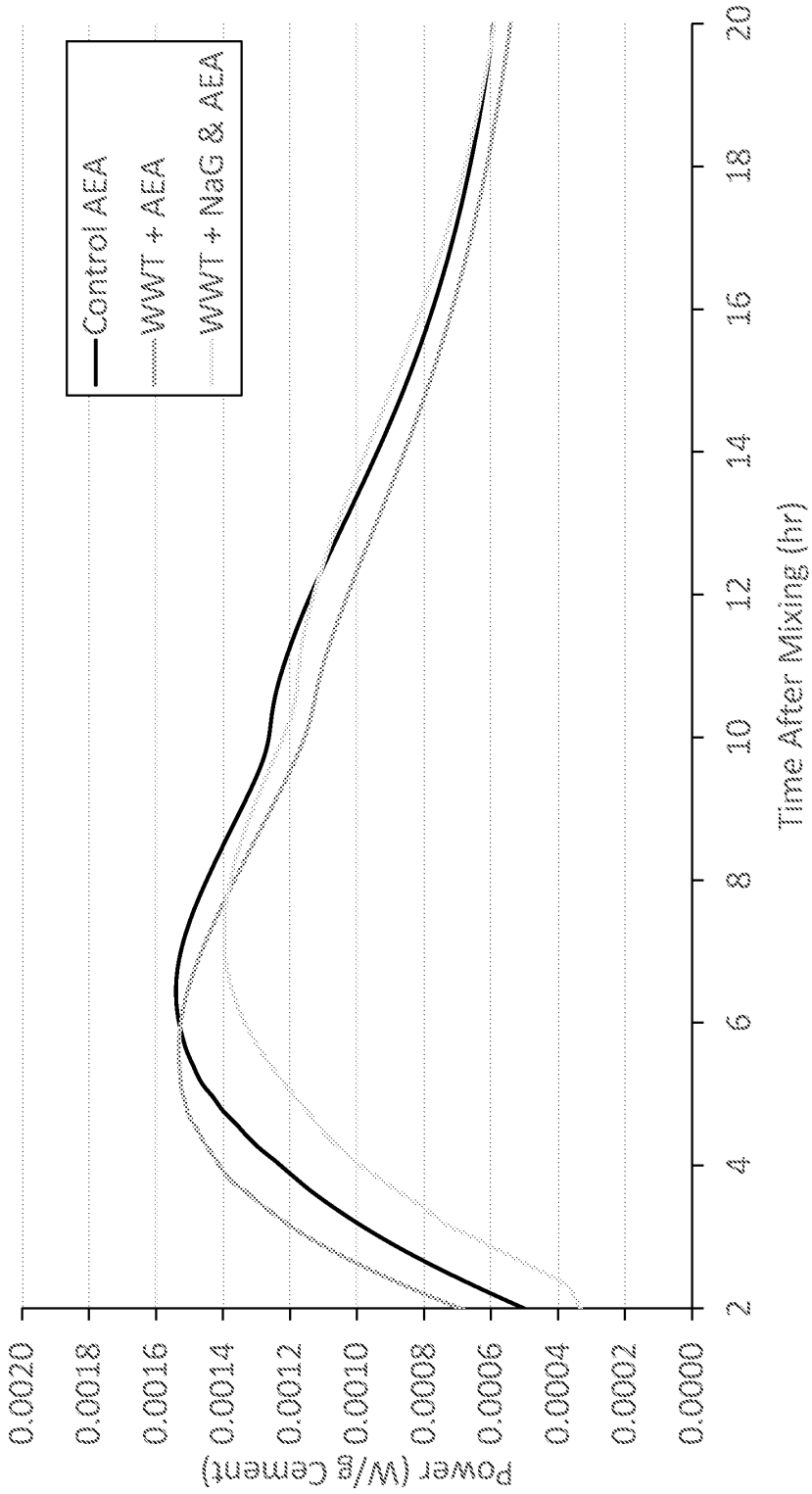

Control AEA
WWT + AEA
WWT + NaG & AEA
Power (W/g Cement)
0.0020
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
Time After Mixing (hr)
2
4
6
8
10
12
14
16
18
20

Figure 76

| Batch ID | Control | WWT | WWT + 2% NaG |
|---|---|---|---|
| Sand Mass (kg) | 22.77 | 22.77 | 22.77 |
| Coarse Aggregate Mass (kg) | 32.91 | 32.91 | 32.91 |
| Cement Mass (kg) | 9.40 | 9.40 | 9.40 |
| Water Mass (kg) | 5.08 | 0 | 0 |
| WW Mass (kg) | 0 | 5.46 | 5.46 |
| WW Solids Mass (kg) | 0 | 0.38 | 0.38 |
| w/c Ratio | 0.63 | 0.60 | 0.60 |
| Volume (m3) | 0.0300 | 0.0300 | 0.0300 |

Figure 77

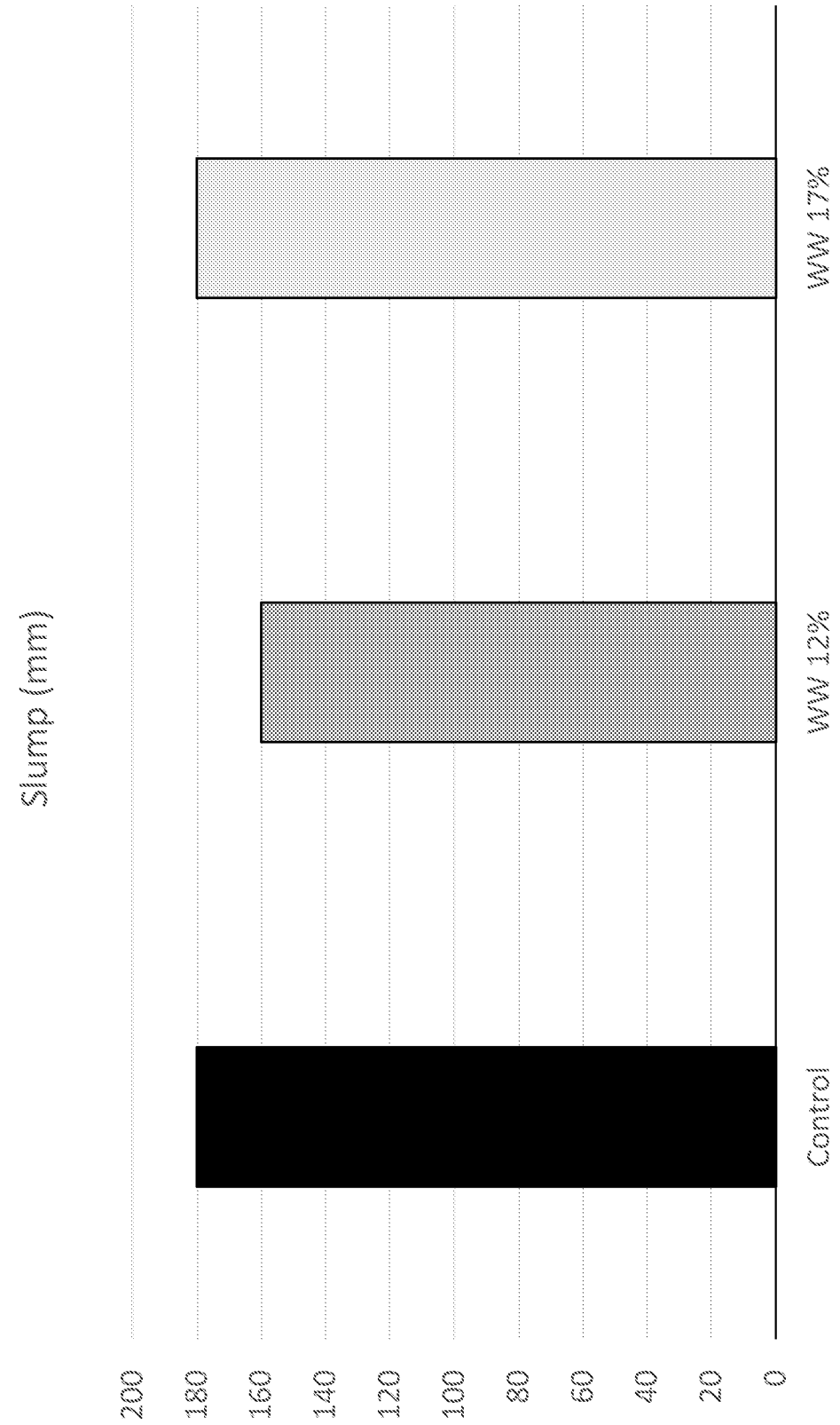


Figure 78

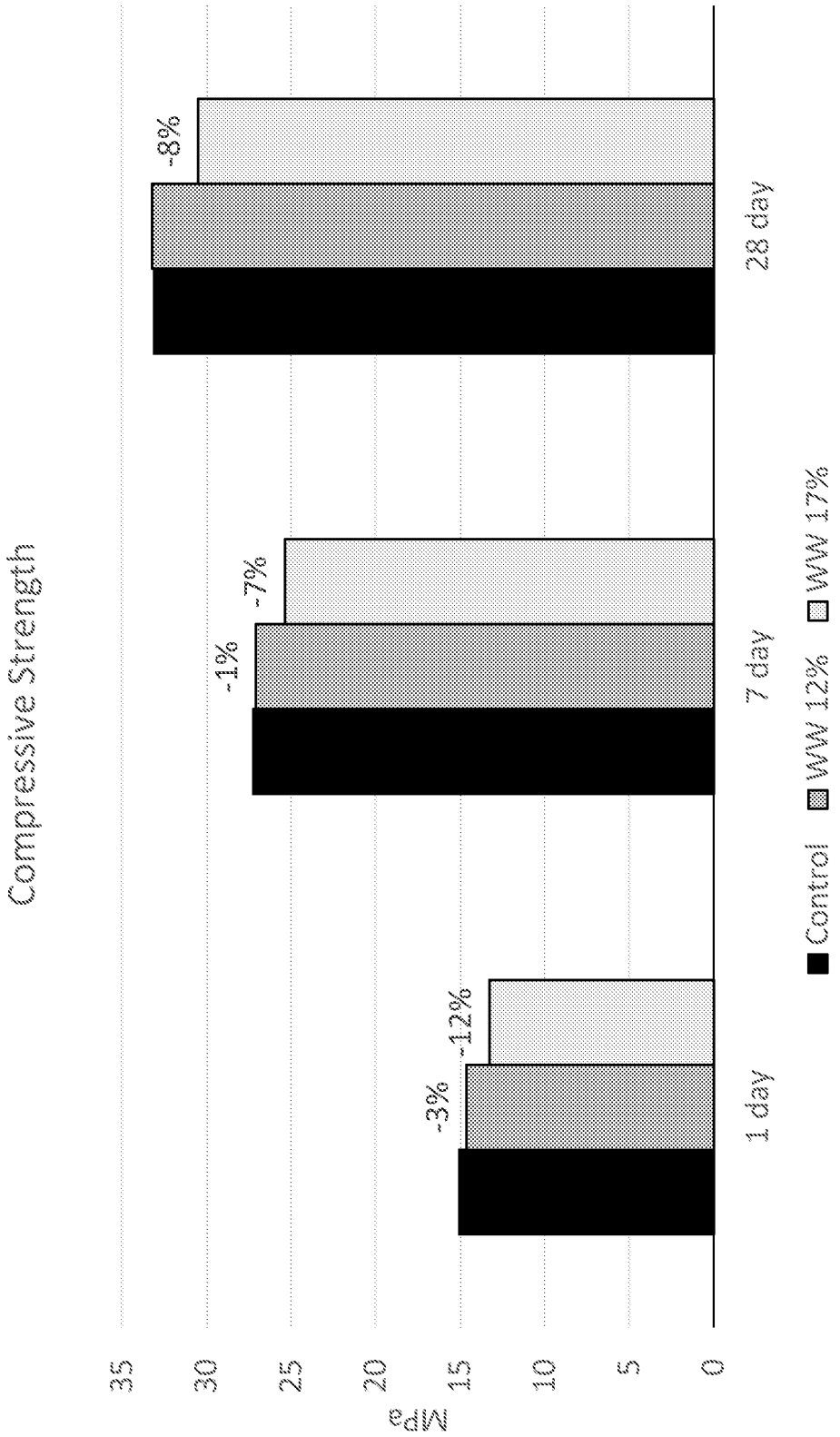

Compressive Strength
MPa
35
30
25
20
15
10
5
0
1 day
7 day
28 day
-3%
-12%
-1%
-7%
-8%
Control
WW 12%
WW 17%

Figure 79

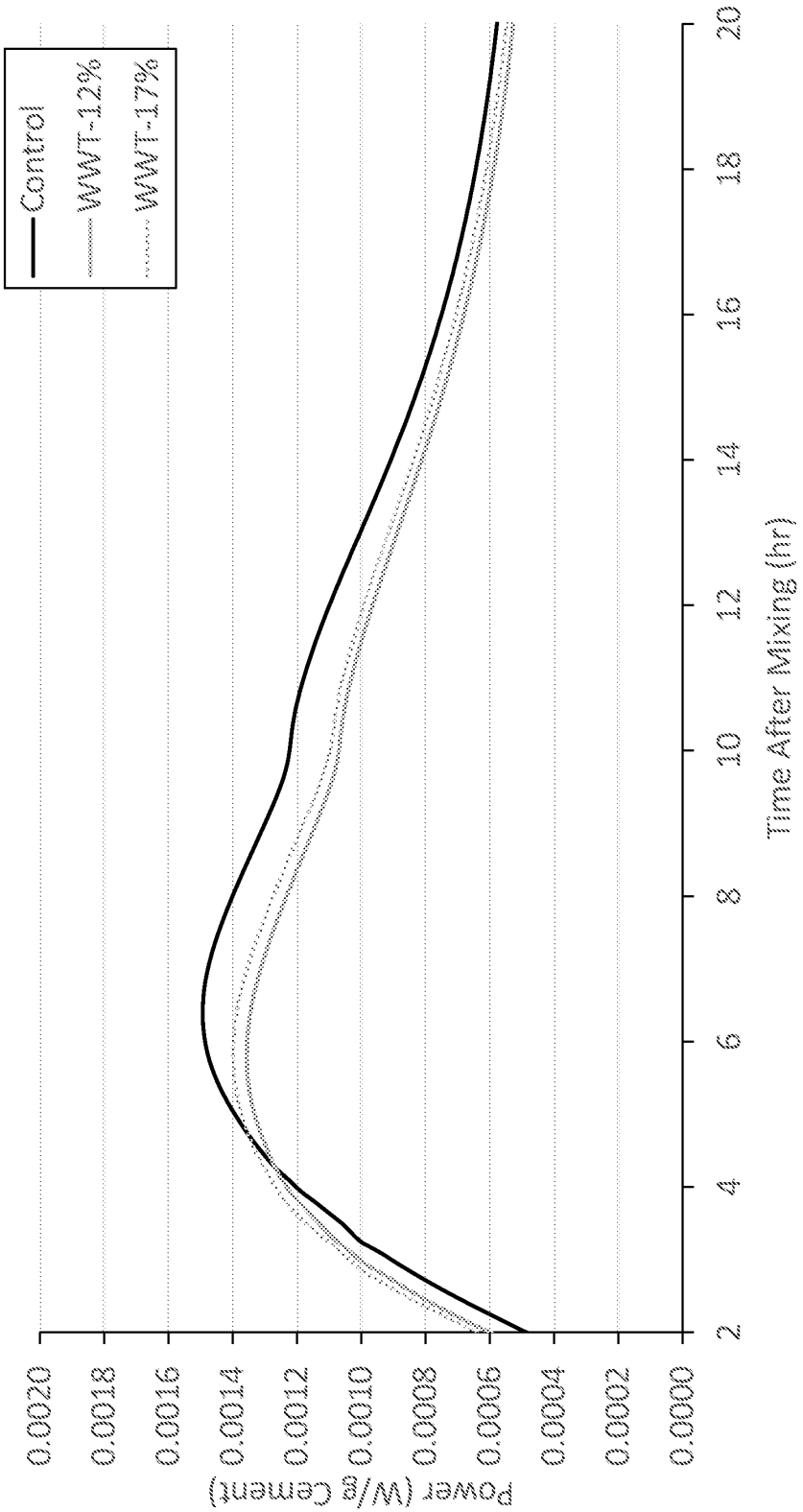

Control
WWT-12%
WWT-17%
Power (W/g cement)
0.0020
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
2
4
6
8
10
12
14
16
18
20
Time After Mixing (hr)

Figure 80

| Batch ID | Control | 12% WWT | 17% WWT |
|---|---|---|---|
| Sand Mass (kg) | 22.77 | 22.77 | 22.77 |
| Coarse Aggregate Mass (kg) | 32.91 | 32.91 | 32.91 |
| Cement Mass (kg) | 9.40 | 9.40 | 9.40 |
| Water Mass (kg) | 5.14 | 0 | 0 |
| WW Mass (kg) | 0 | 5.84 | 6.19 |
| WW Solids Mass (kg) | 0 | 0.41 | 0.43 |
| w/c Ratio | 0.63 | 0.63 | 0.66 |
| Volume (m3) | 0.0300 | 0.0303 | 0.0307 |

Figure 81

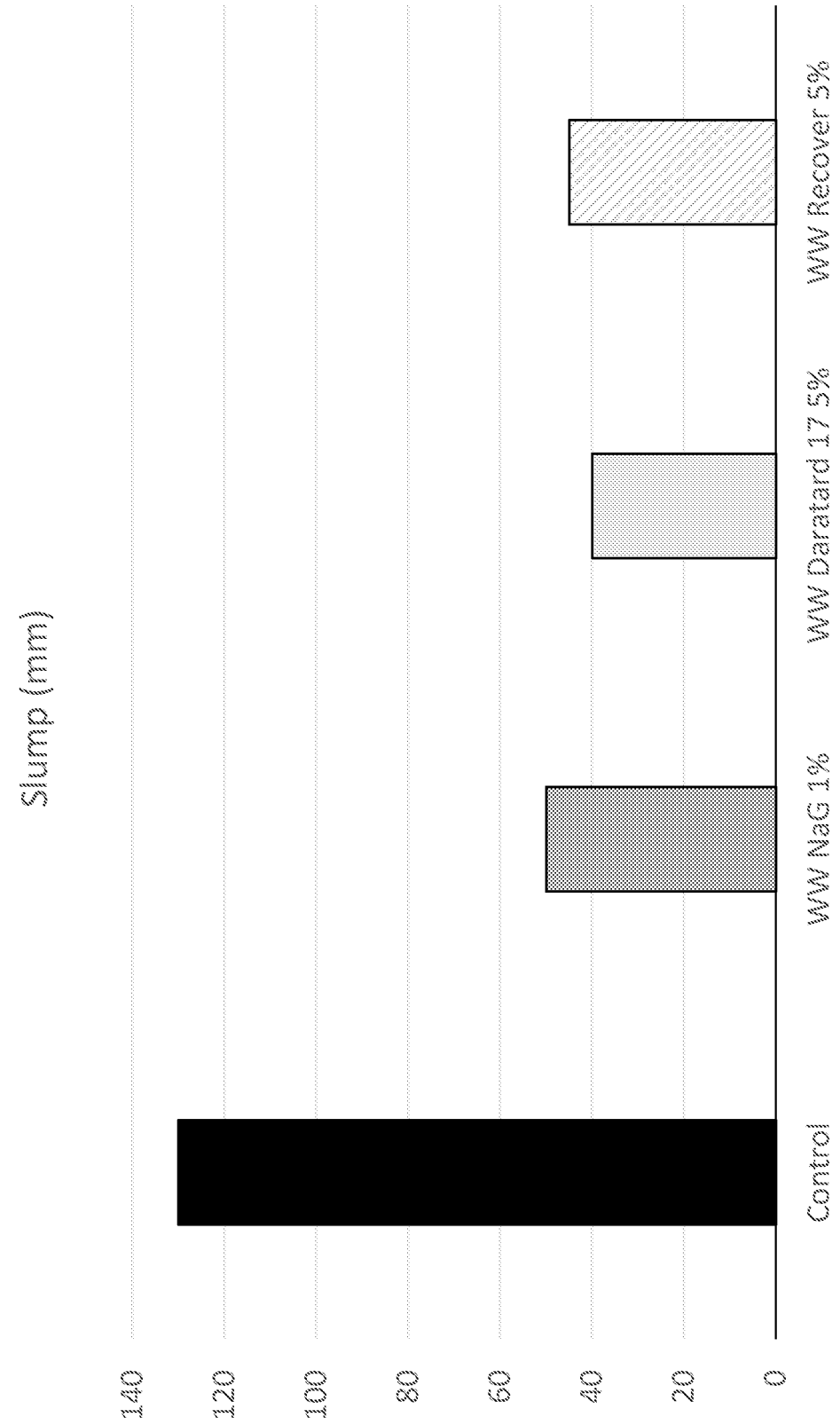

Slump (mm)
140
120
100
80
60
40
20
0
Control
WW NaG 1%
WW Daratard 17 5%
WW Recover 5%

Figure 82

Compressive Strength

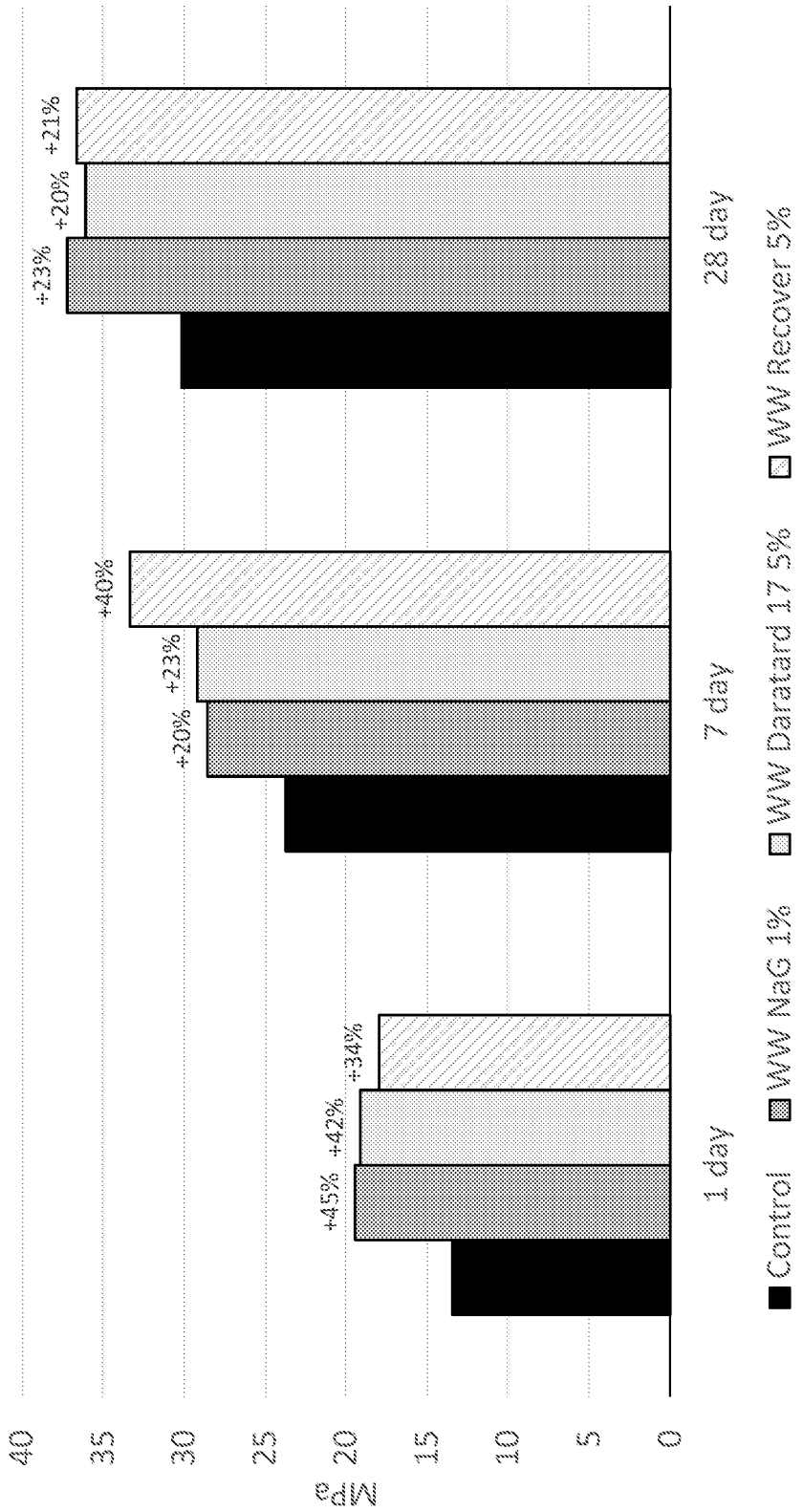


Figure 83

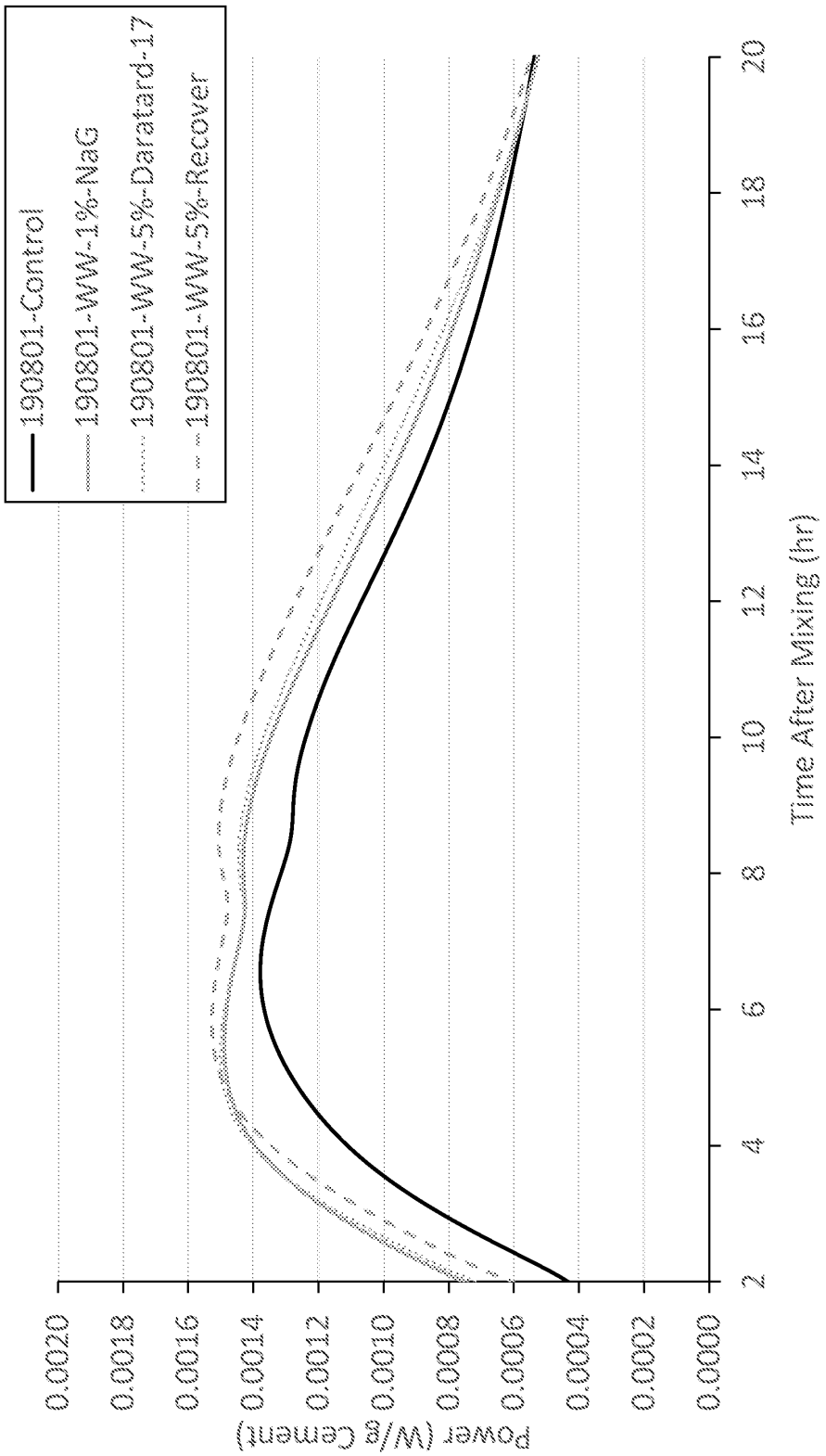

190801-Control
190801-WW-1%-NaG
190801-WW-5%-Daratard-17
190801-WW-5%-Recover
Power (W/g Cement)
0.0020
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
2
4
6
8
10
12
14
16
18
20
Time After Mixing (hr)

Figure 84

| Batch ID | Control | WWT + NaG | WWT + Daratard 17 | WWT + Recover |
|---|---|---|---|---|
| Sand Mass (kg) | 16.50 | 16.50 | 16.50 | 16.50 |
| Coarse Aggregate Mass (kg) | 23.85 | 23.85 | 23.85 | 23.85 |
| Cement Mass (kg) | 6.82 | 6.82 | 6.82 | 6.82 |
| Water Mass (kg) | 3.81 | 0 | 0 | 0 |
| WW Mass (kg) | 0 | 4.39 | 4.39 | 4.39 |
| WW Solids Mass (kg) | 0 | 0.58 | 0.58 | 0.58 |
| w/c Ratio | 0.63 | 0.58 | 0.58 | 0.58 |
| Volume (m3) | 0.0218 | 0.0218 | 0.0218 | 0.0218 |

Figure 85

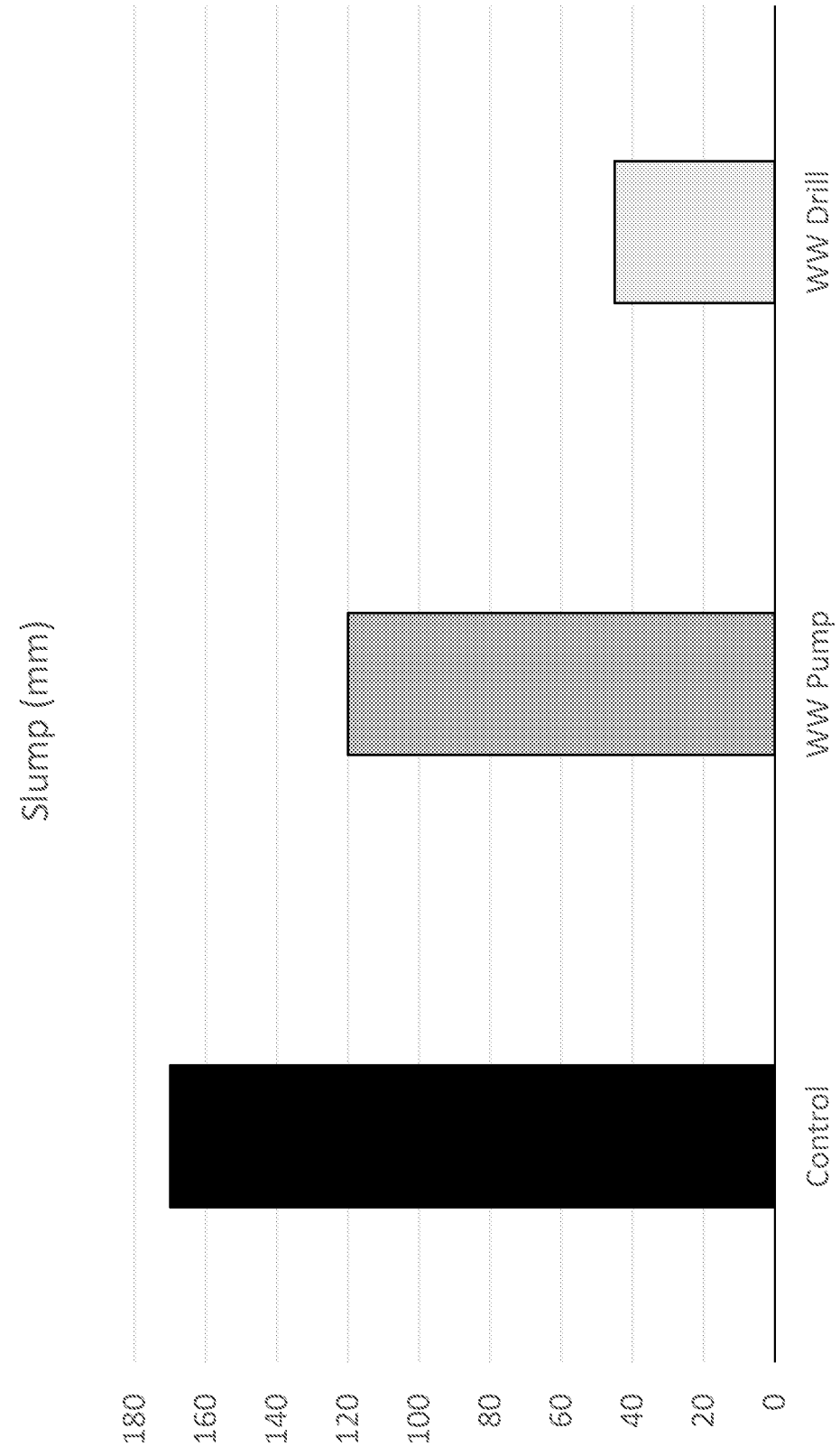

Slump (mm)
180
160
140
120
100
80
60
40
20
0
Control
WW Pump
WW Drill

Figure 86

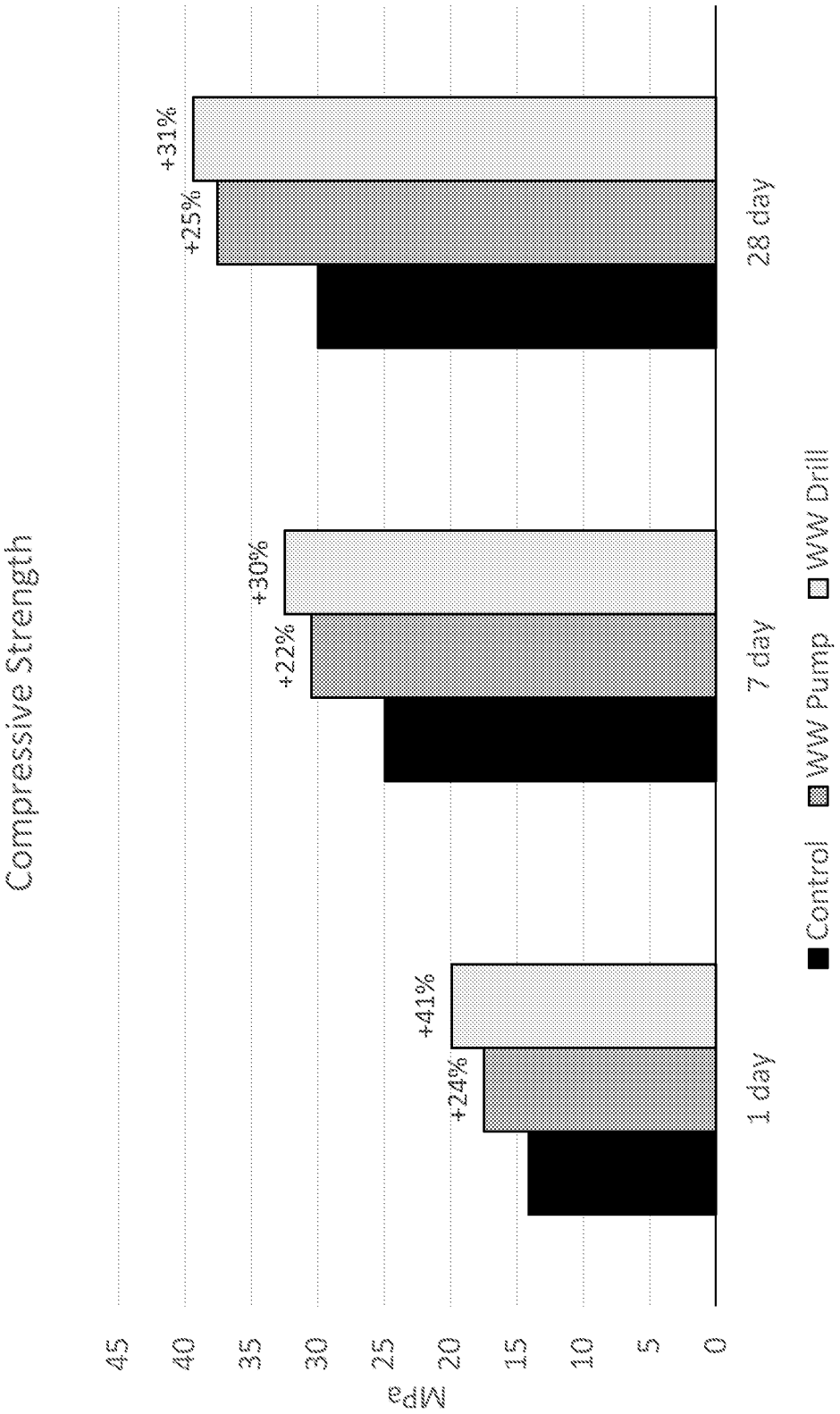
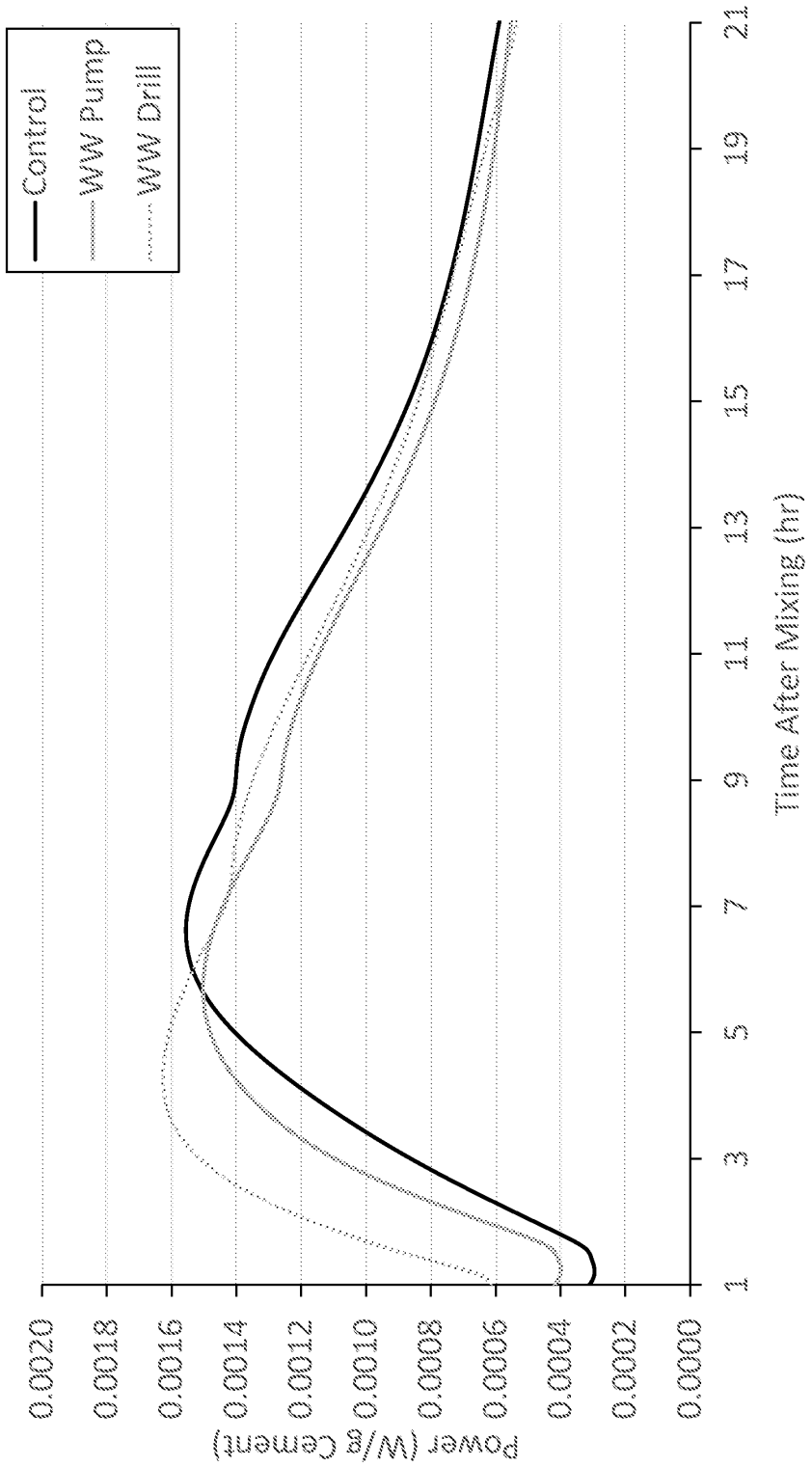

Compressive Strength
MPa
45
40
35
30
25
20
15
10
5
0
+31%
+25%
+30%
+22%
+41%
+24%
1 day
7 day
28 day
Control
WW pump
WW Drill

Figure 87


Control
WW Pump
WW Drill
Power (W/g Cement)
0.0020
0.0018
0.0016
0.0014
0.0012
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
1
3
5
7
9
11
13
15
17
19
21
Time After Mixing (hr)

# Figure 88

| Batch ID | Control | WWT Pump | WWT Drill |
|---|---|---|---|
| Sand Mass (kg) | 22.77 | 22.77 | 22.77 |
| Coarse Aggregate Mass (kg) | 32.91 | 32.91 | 32.91 |
| Cement Mass (kg) | 9.40 | 9.40 | 9.40 |
| Water Mass (kg) | 4.92 | 0 | 0 |
| WW Mass (kg) | 0 | 5.68 | 5.68 |
| WW Solids Mass (kg) | 0 | 0.76 | 0.76 |
| w/c Ratio | 0.63 | 0.58 | 0.58 |
| Volume (m3) | 0.0300 | 0.0300 | 0.0300 |

# Figure 89

| Trial # | # of injection points | Total reaction hose length (ft) | Inline Mixing | CO2 Gas Flowrate (SLPM) per injection point | CO2 Gas Flowrate (SLPM) total | CO2 uptake (% bwc) | Uptake Efficiency |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 20 | NO | 200 | 200 | 1.3% | 100% |
| 2 | 1 | 20 | NO | 400 | 400 | 1.7% | 51% |

# Figure 90

| Trial # | # of injection points | Total reaction hose length (ft) | Inline Mixing | CO2 Gas Flowrate (SLPM) per injection point | CO2 Gas Flowrate (SLPM) total | CO2 uptake (% bwc) | Uptake Efficiency |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 20 | NO | 400 | 400 | 1.7% | 51% |
| 2 | 1 | 20 | YES | 400 | 400 | 2.4% | 70% |

Figure 91

| Trial # | # of injection points | Total reaction hose length (ft) | Inline Mixing | CO2 Gas Flowrate (SLPM) per injection point | CO2 Gas Flowrate (SLPM) total | CO2 uptake (% bwc) | Uptake Efficiency |
|---|---|---|---|---|---|---|---|
| 1 | 1 | 20 | YES | 400 | 400 | 2.4% | 70% |
| 2 | 2 | 40 | YES | 400 | 800 | 2.5% | 84% |

Figure 92

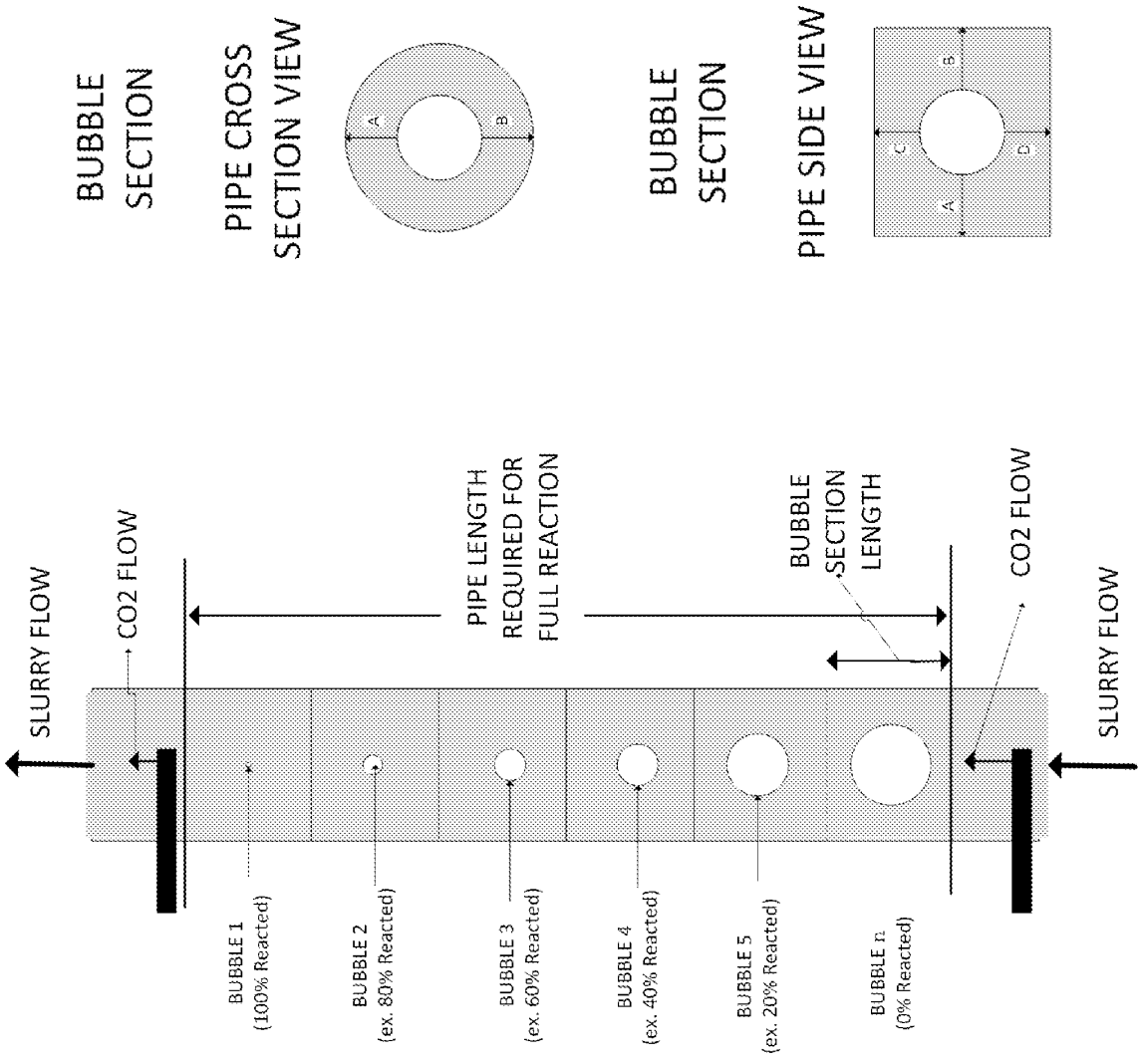

BUBBLE SECTION
PIPE CROSS SECTION VIEW
A
B
BUBBLE SECTION
PIPE SIDE VIEW
C
B
A
D
SLURRY FLOW
CO2 FLOW
PIPE LENGTH REQUIRED FOR FULL REACTION
BUBBLE SECTION LENGTH
CO2 FLOW
SLURRY FLOW
BUBBLE 1 (100% Reacted)
BUBBLE 2 (ex. 80% Reacted)
BUBBLE 3 (ex. 60% Reacted)
BUBBLE 4 (ex. 40% Reacted)
BUBBLE 5 (ex. 20% Reacted)
BUBBLE n (0% Reacted)

Figure 93

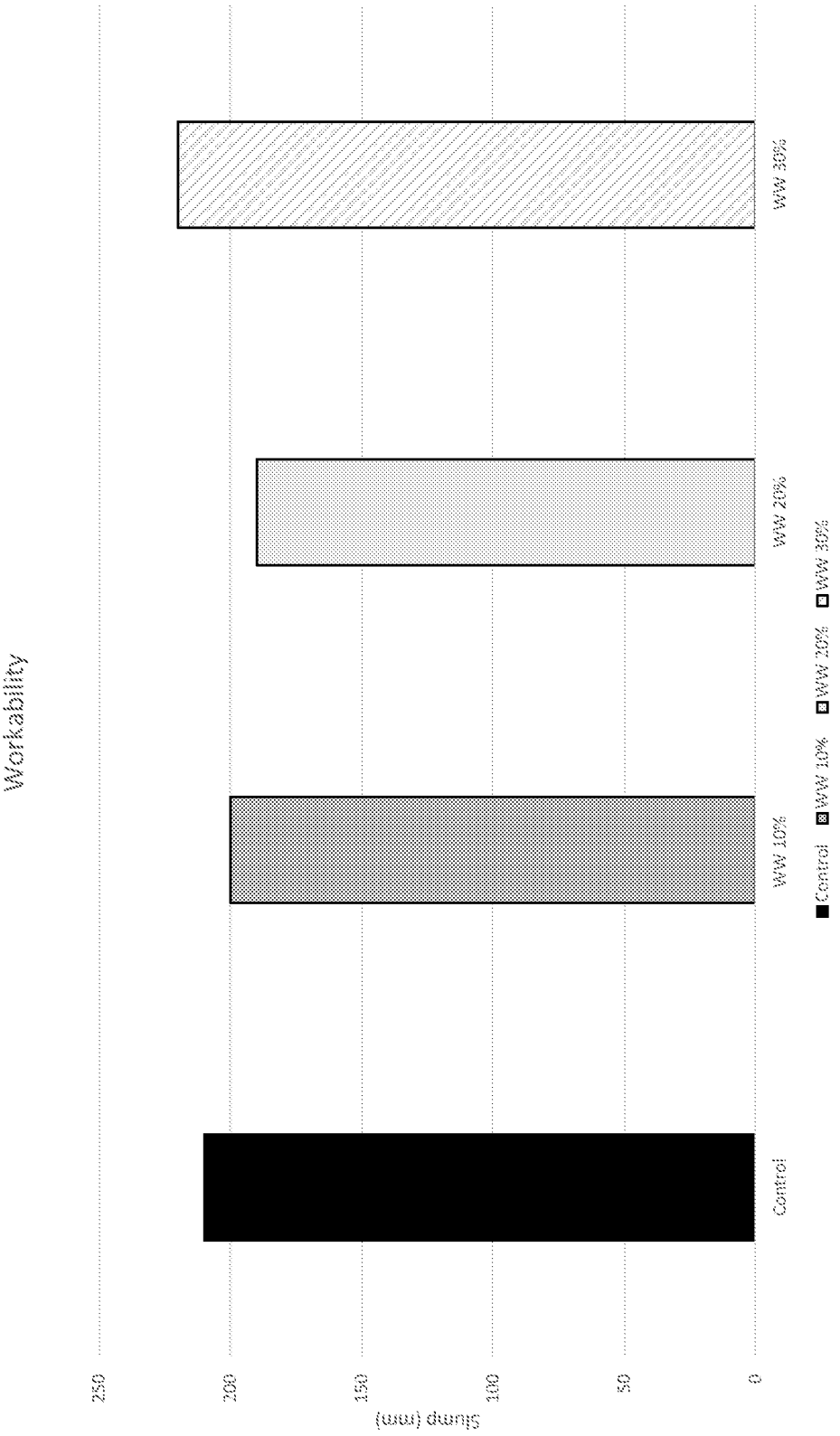

Workability
Slump (mm)
250
200
150
100
50
0
Control
WW 10%
WW 20%
WW 30%
Control
WW 10%
WW 20%
WW 30%

Figure 94

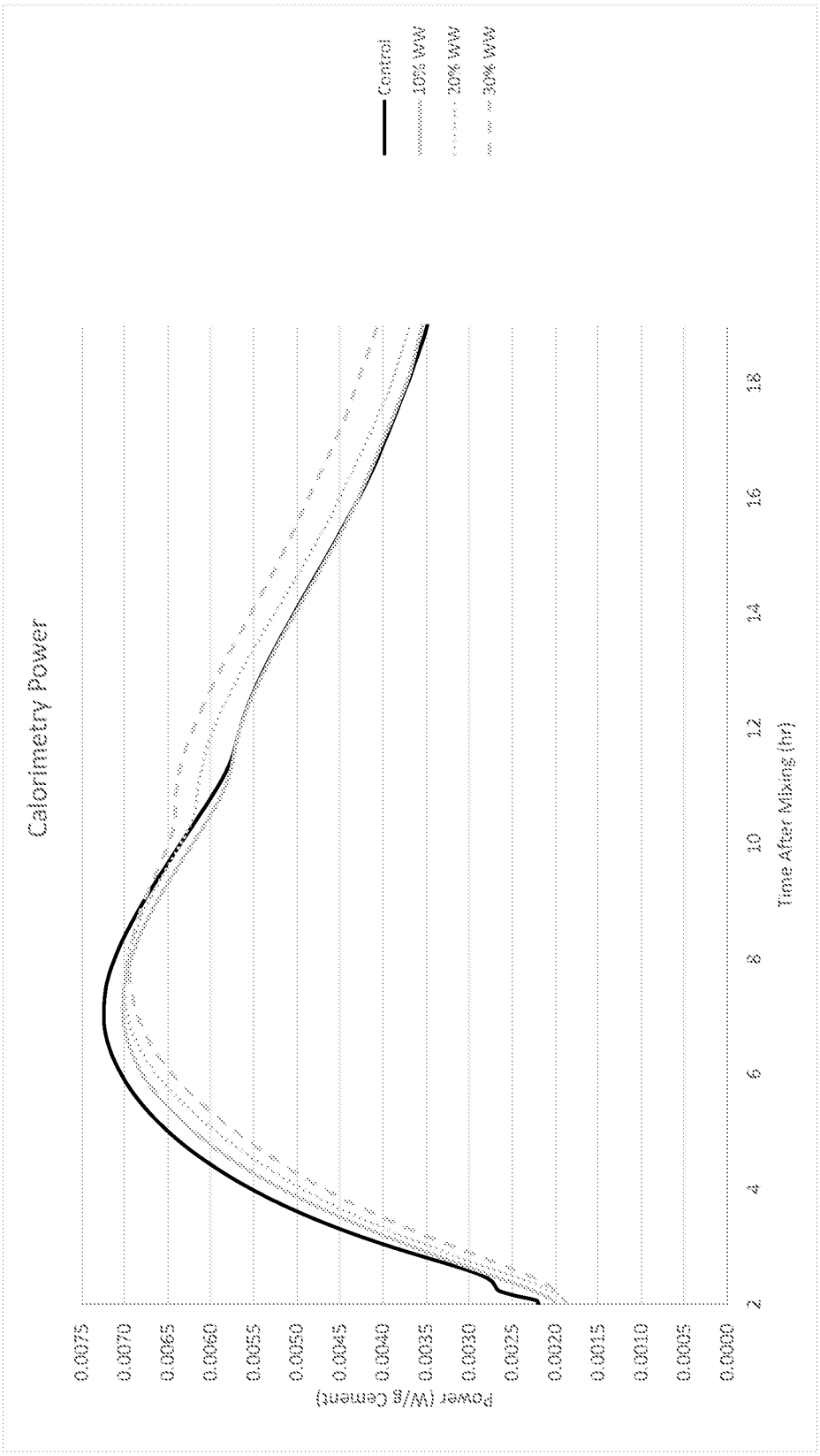
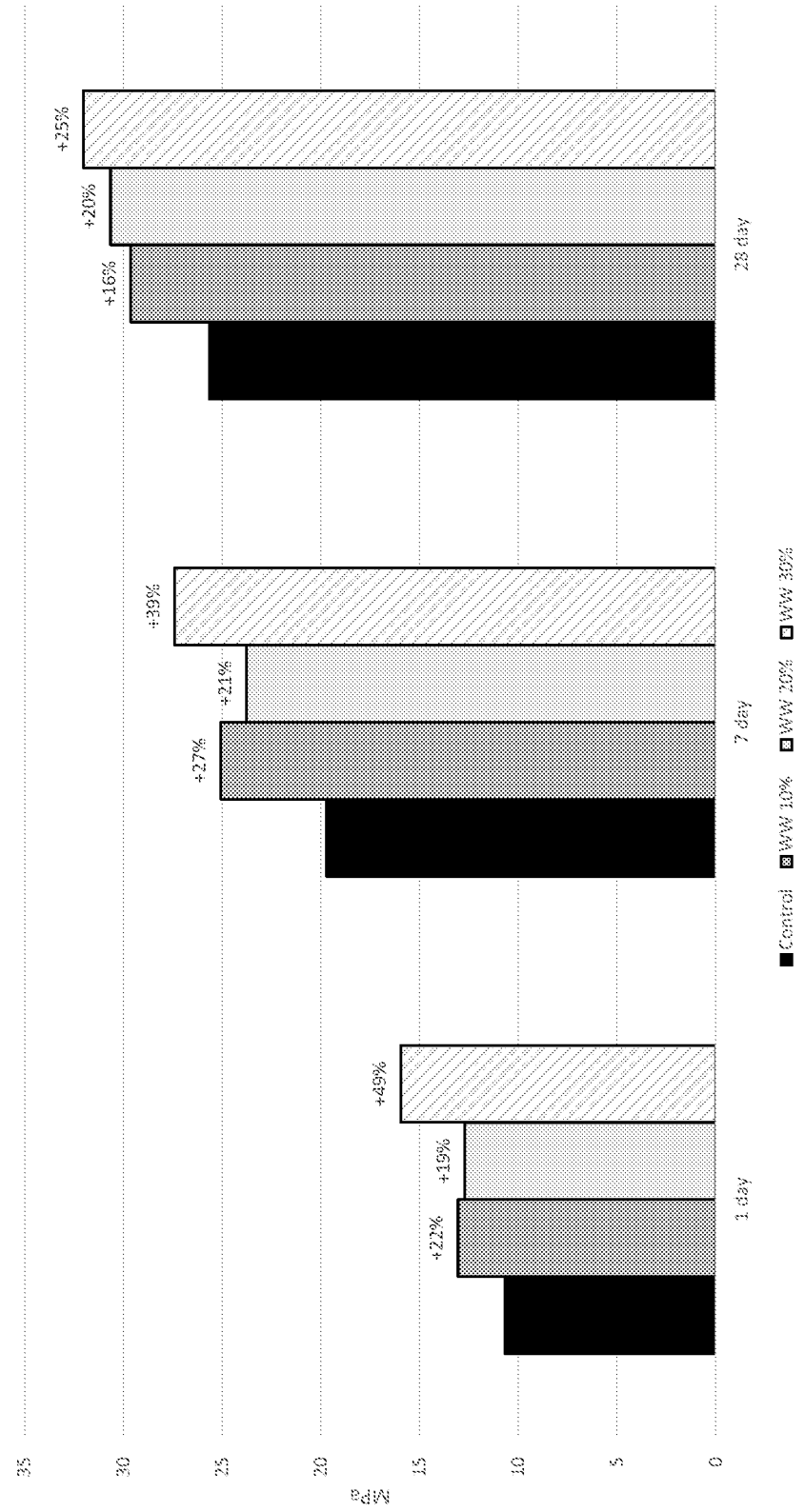

Calorimetry Power
Control
10% WW
20% WW
30% WW
Power (W/g Cement)
0.0075
0.0070
0.0065
0.0060
0.0055
0.0050
0.0045
0.0040
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
Time After Mixing (hr)
2
4
6
8
10
12
14
16
18

Figure 95

Compressive Strength



# Figure 96

| Batch ID | Control | 10% WWT | 20% WWT | 30% WWT |
|---|---|---|---|---|
| Cement Mass (kg) | 6.82 | 6.82 | 6.82 | 6.82 |
| Coarse Aggregate Mass (kg) | 23.85 | 23.85 | 23.85 | 23.85 |
| Sand Mass (kg) | 16.5 | 16.5 | 16.5 | 16.5 |
| Water Mass (kg) | 4.00 | 3.60 | 3.20 | 2.80 |
| WW Mass (kg) | 0 | 0.49 | 0.99 | 1.48 |
| WW Solids Mass (kg) | 0 | 0.09 | 0.19 | 0.28 |
| w/c Ratio | 0.59 | 0.58 | 0.57 | 0.56 |

Figure 97

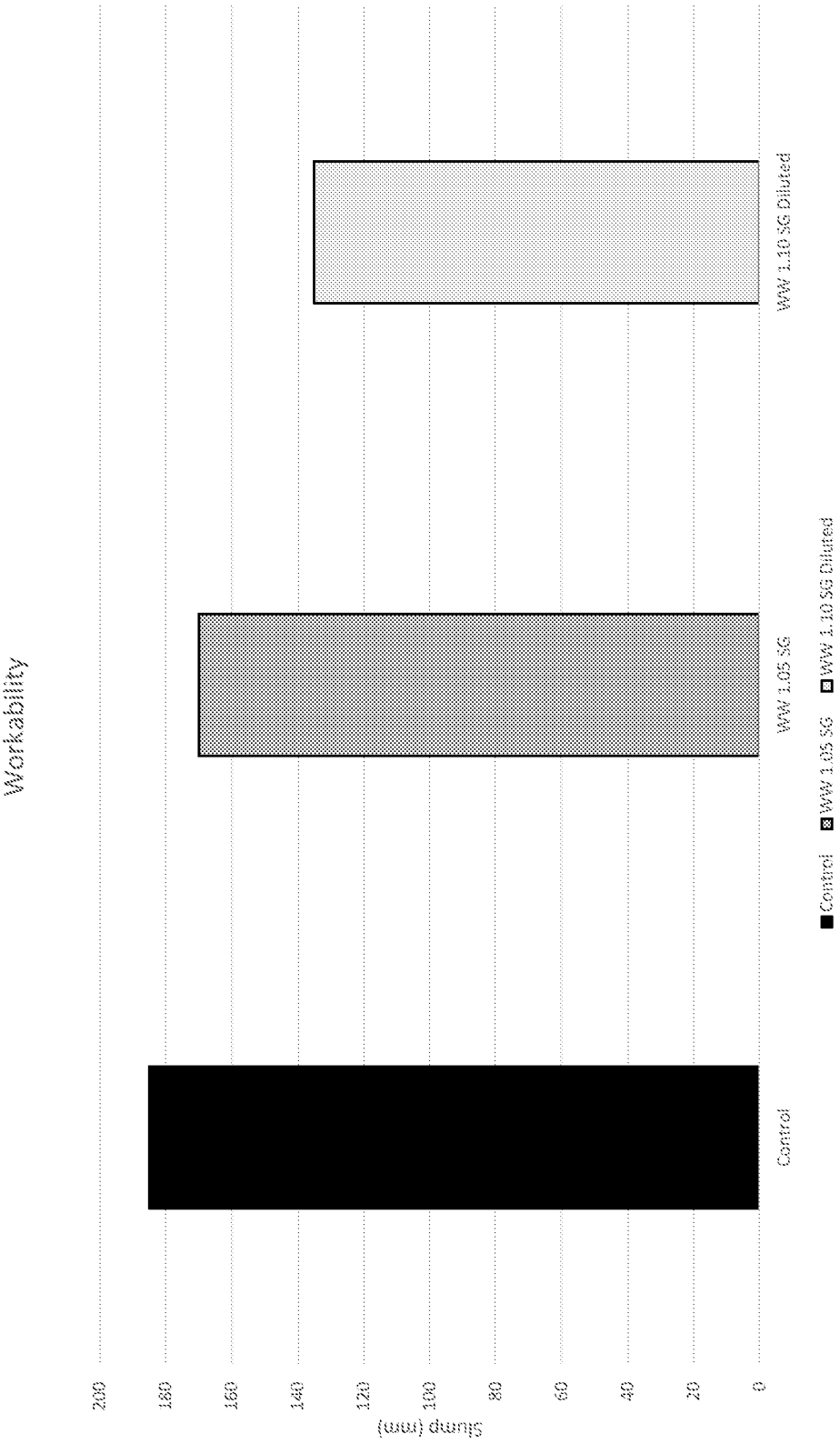

Workability
Slump (mm)
200
180
160
140
120
100
80
60
40
20
0
Control
WW 1.05 SG
WW 1.10 SG Diluted
Control
WW 1.05 SG
WW 1.10 SG Diluted

Figure 98

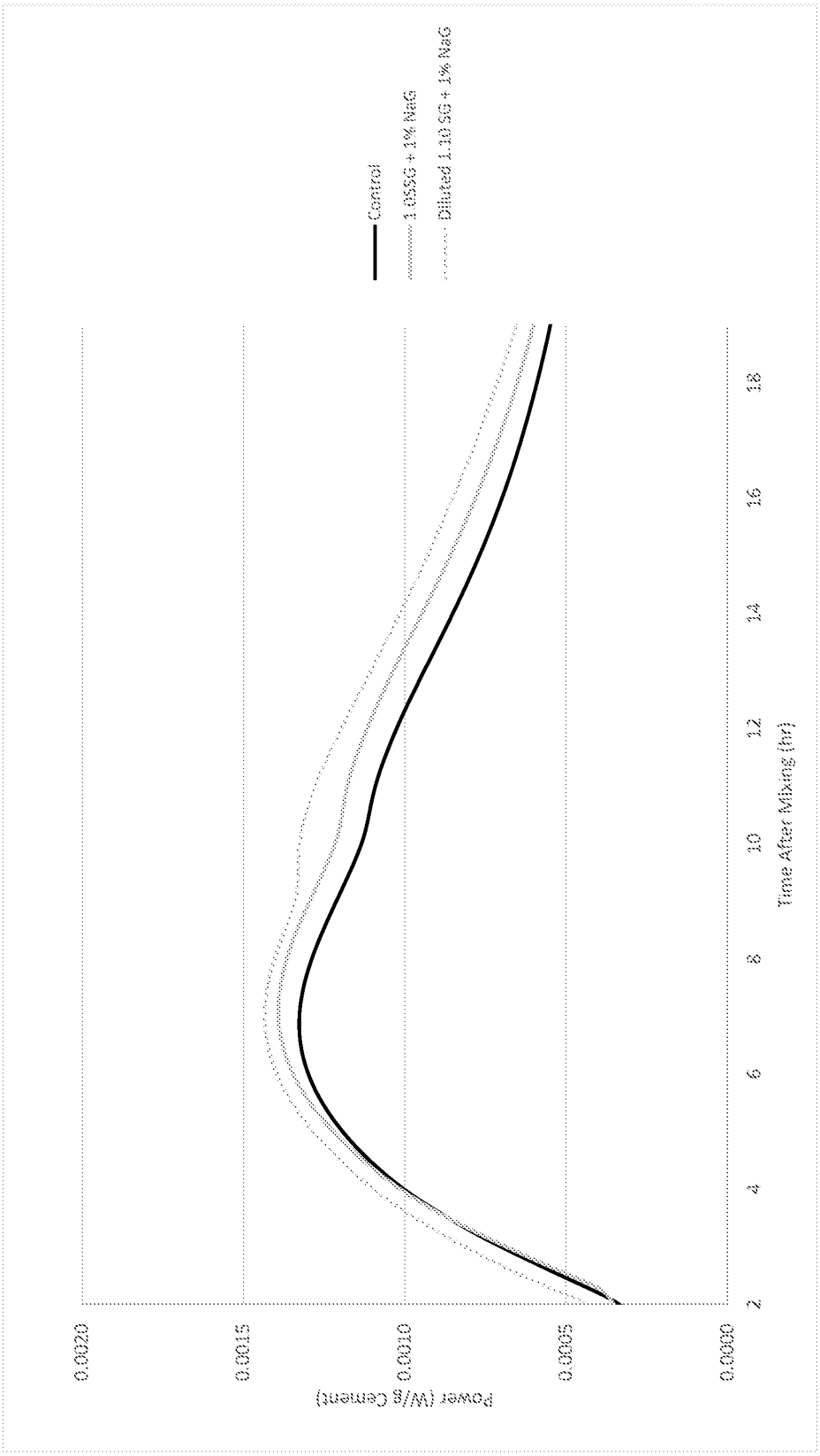
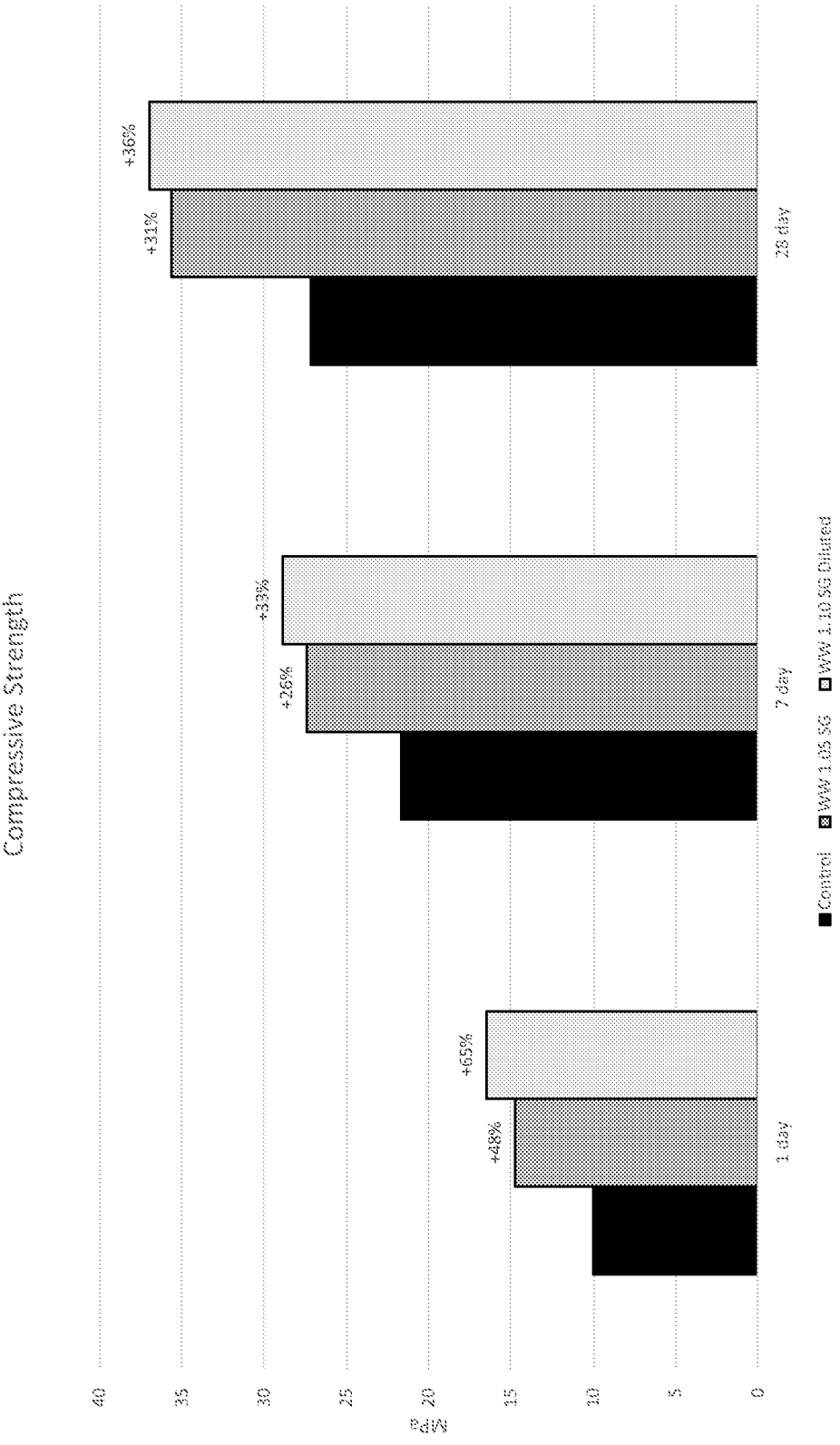

Control
1.05SG + 1% NaG
Diluted 1.10 SG + 1% NaG
Power (W/g Cement)
0.0020
0.0015
0.0010
0.0005
0.0000
2
4
6
8
10
12
14
16
18
Time After Mixing (hr)

Figure 99


Compressive Strength
+36%
+31%
28 day
+33%
+26%
7 day
+65%
+48%
1 day
Control
WW 1.05 SG
WW 1.10 SG Diluted
40
35
30
25
20
15
10
5
0

# Figure 100

| Batch ID | Control | 1.05 SG WWT | Diluted 1.10 SG WWT |
|---|---|---|---|
| Cement Mass (kg) | 6.82 | 6.82 | 6.82 |
| Coarse Aggregate Mass (kg) | 23.90 | 23.90 | 23.90 |
| Sand Mass (kg) | 16.74 | 16.74 | 16.74 |
| Water Mass (kg) | 3.99 | 0 | 2.00 |
| WW Mass (kg) | 0 | 4.29 | 2.30 |
| WW Solids Mass (kg) | 0 | 0.30 | 0.31 |
| w/c Ratio | 0.63 | 0.60 | 0.60 |

Figure 101

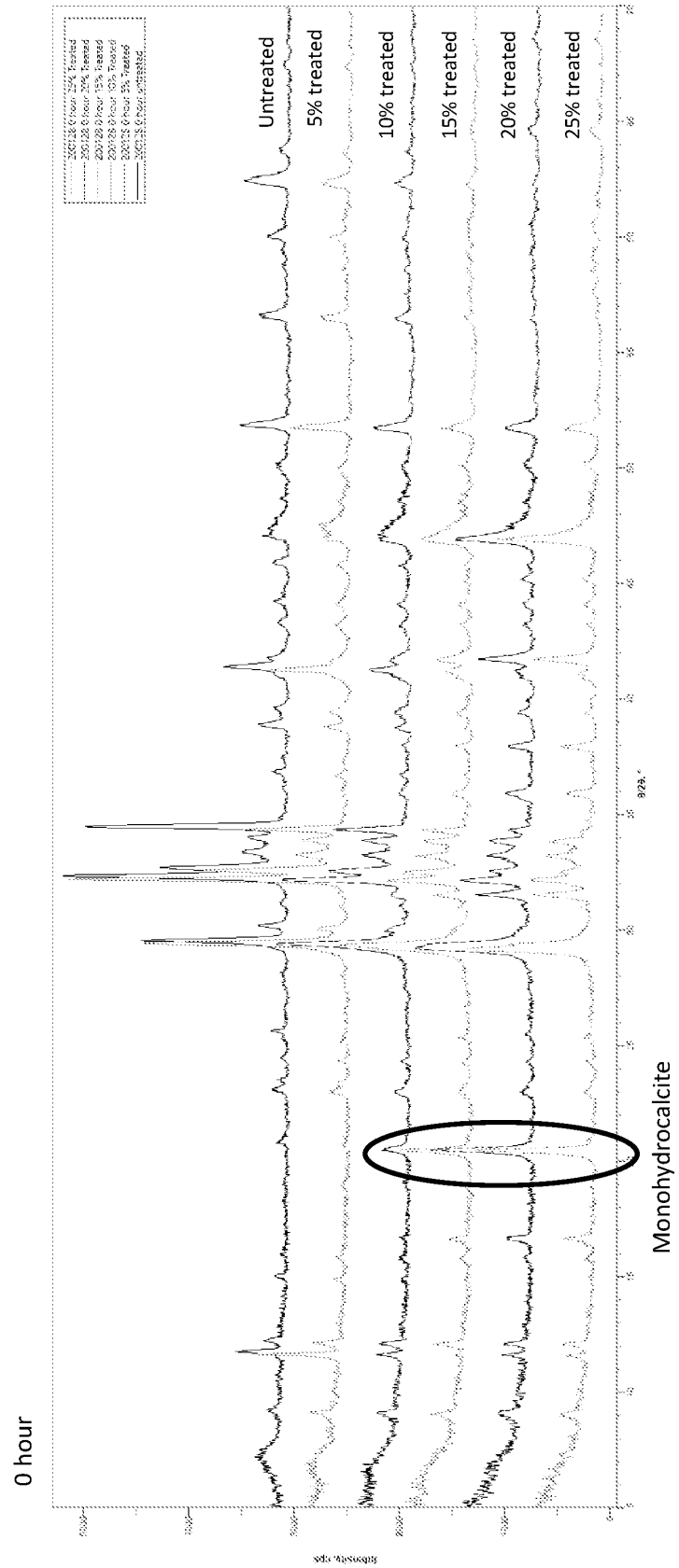

0 hour
Untreated
5% treated
10% treated
15% treated
20% treated
25% treated
Monohydrocalcite

Figure 102

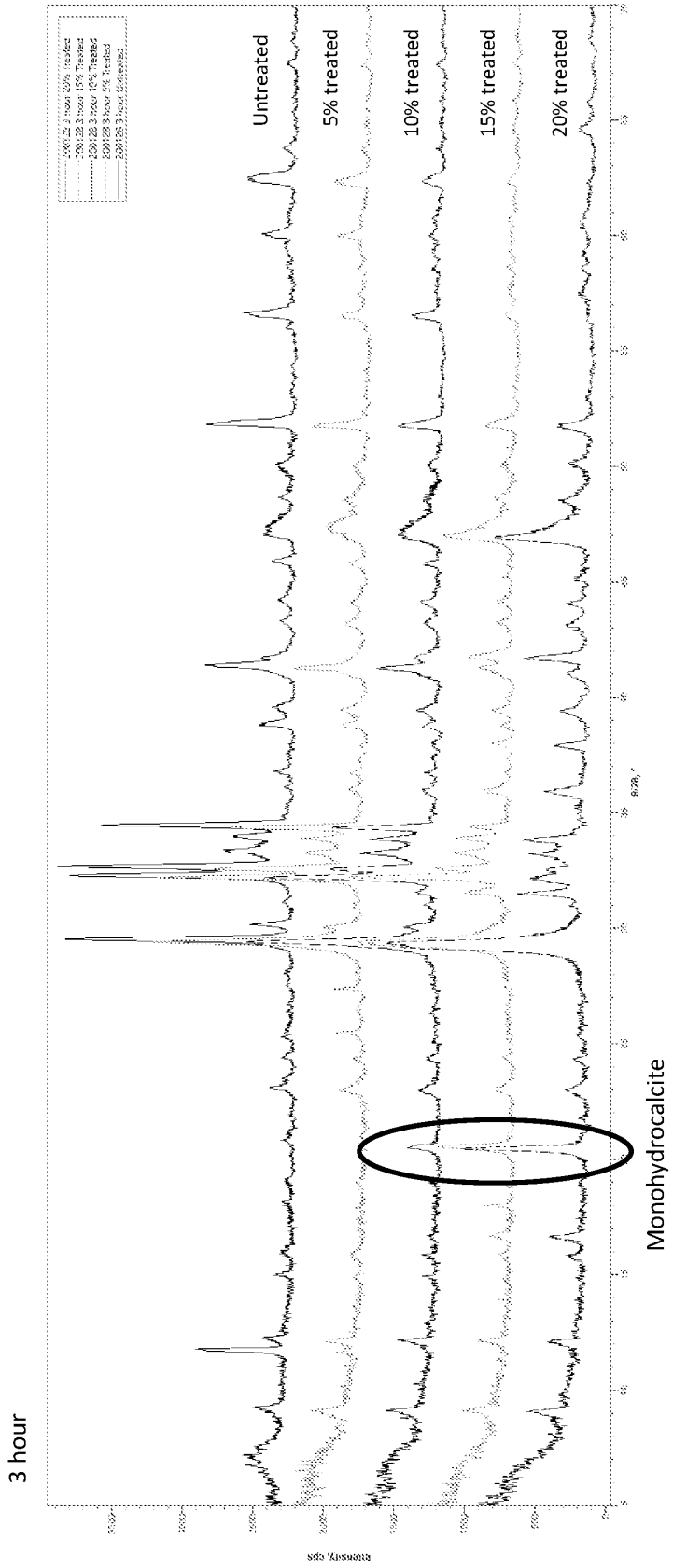

3 hour
Untreated
5% treated
10% treated
15% treated
20% treated
Monohydrocalcite

Figure 103

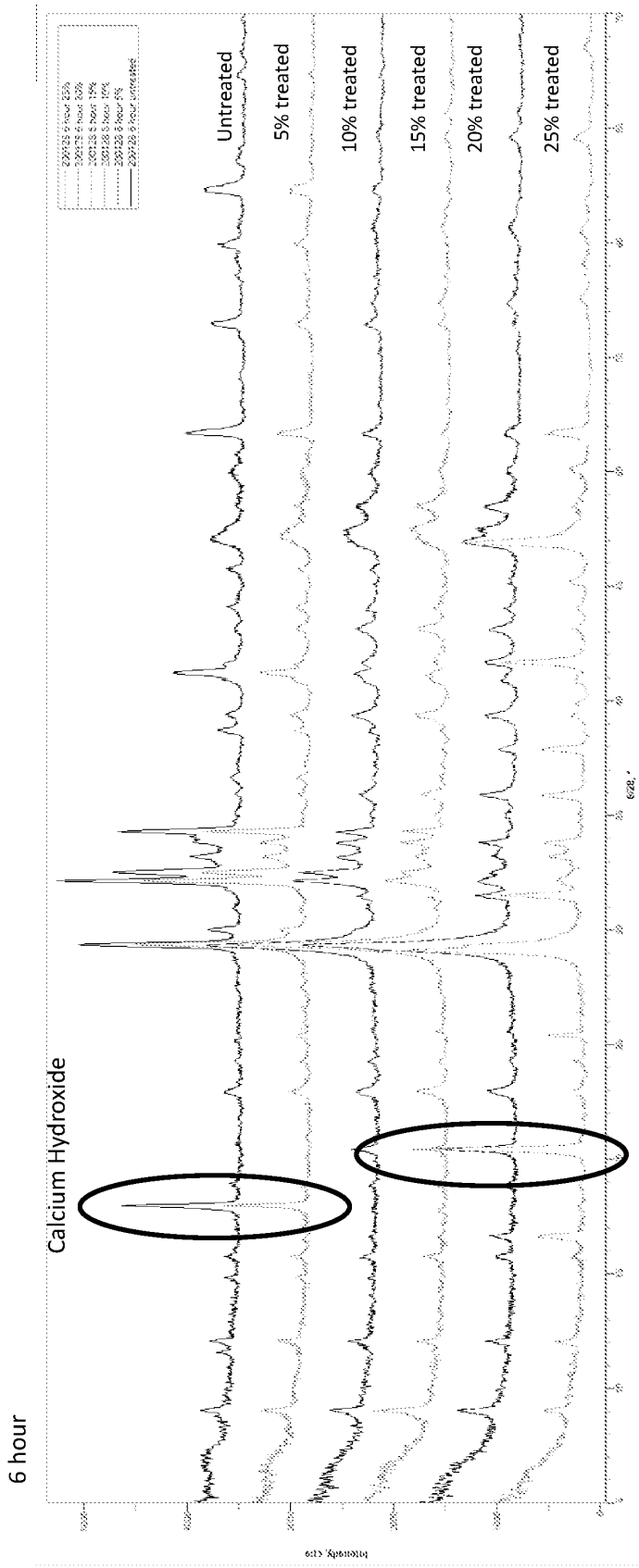

6 hour
Calcium Hydroxide
Monohydrocalcite
Untreated
5% treated
10% treated
15% treated
20% treated
25% treated

Figure 104

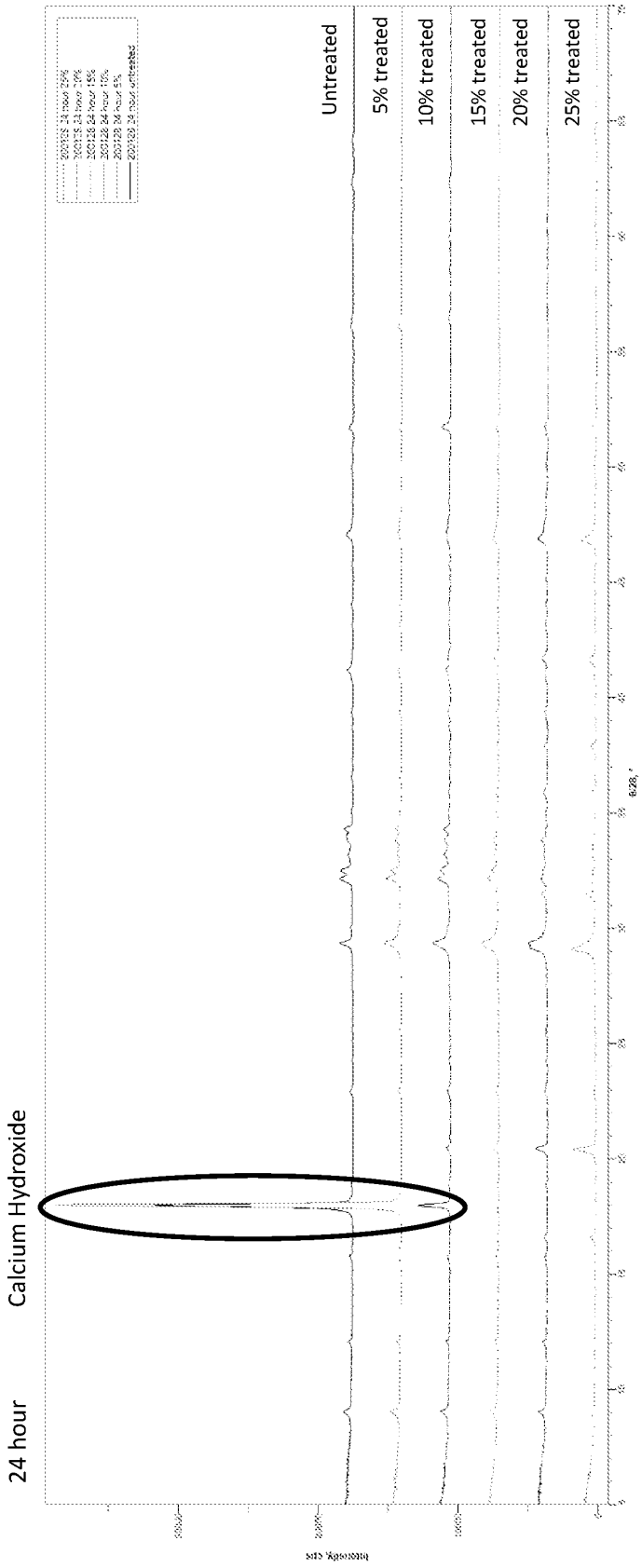

Untreated
5% treated
10% treated
15% treated
20% treated
25% treated
Calcium Hydroxide
24 hour

Figure 105

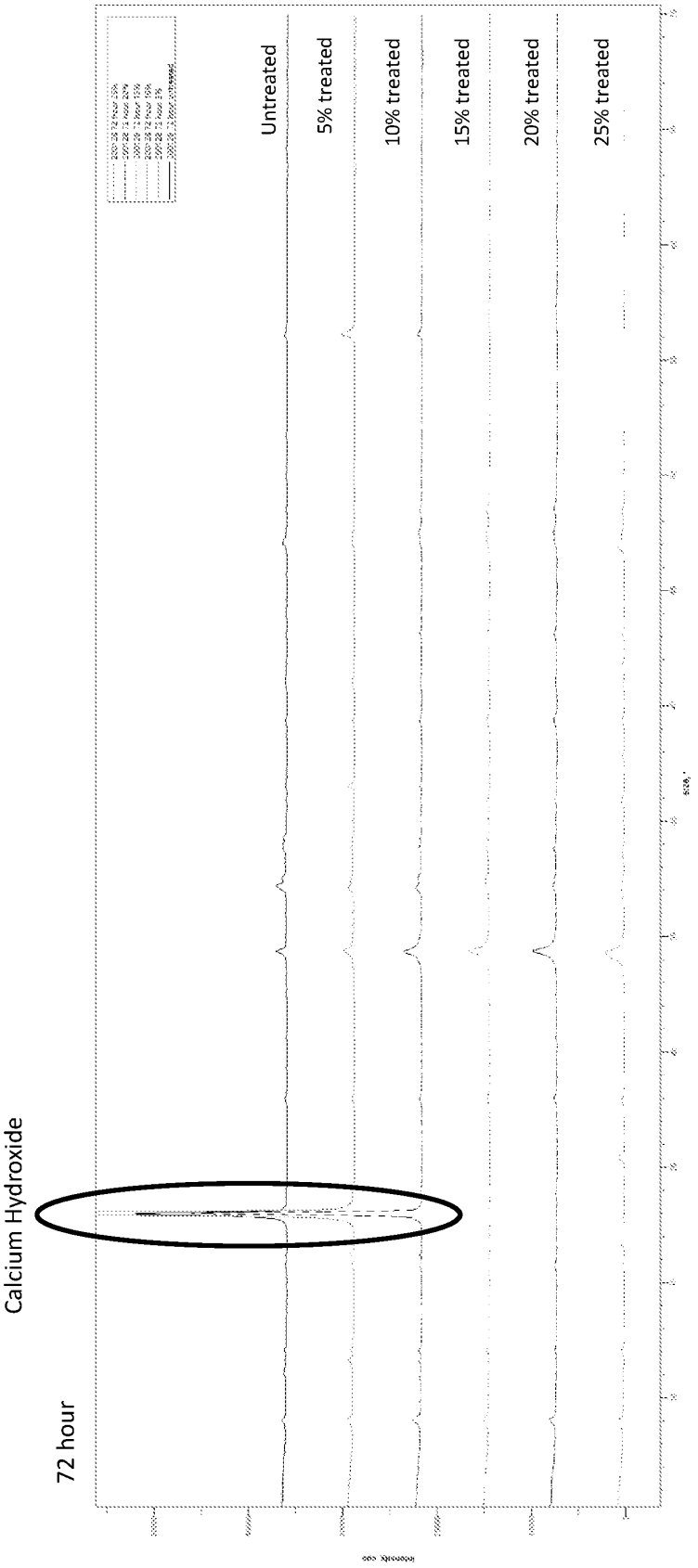

Calcium Hydroxide
72 hour
Untreated
5% treated
10% treated
15% treated
20% treated
25% treated

Figure 106

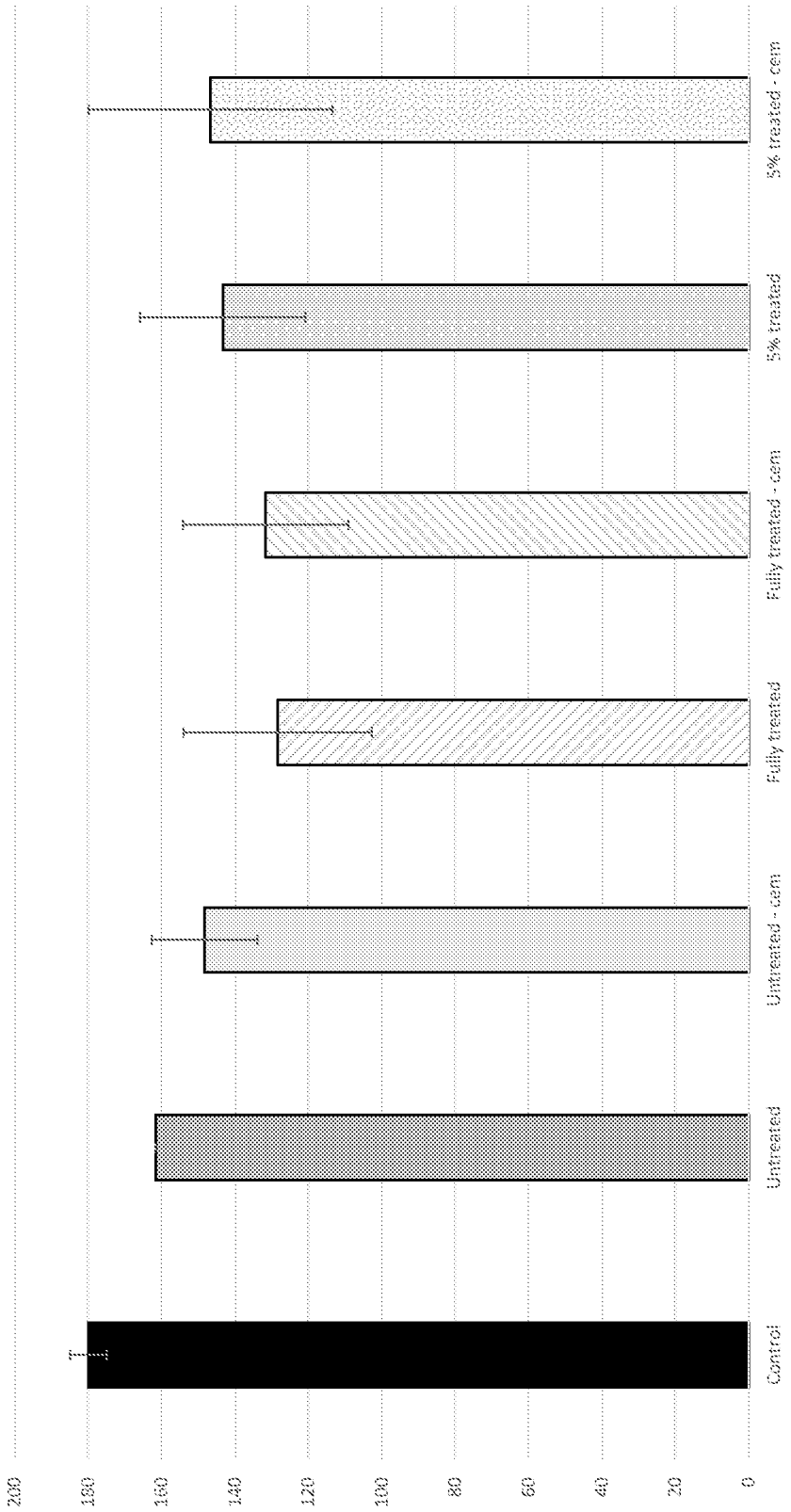

AVG Slump (mm)
200
180
160
140
120
100
80
60
40
20
0
Control
Untreated
Untreated - cem
Fully treated
Fully treated - cem
5% treated
5% treated - cem

Figure 107

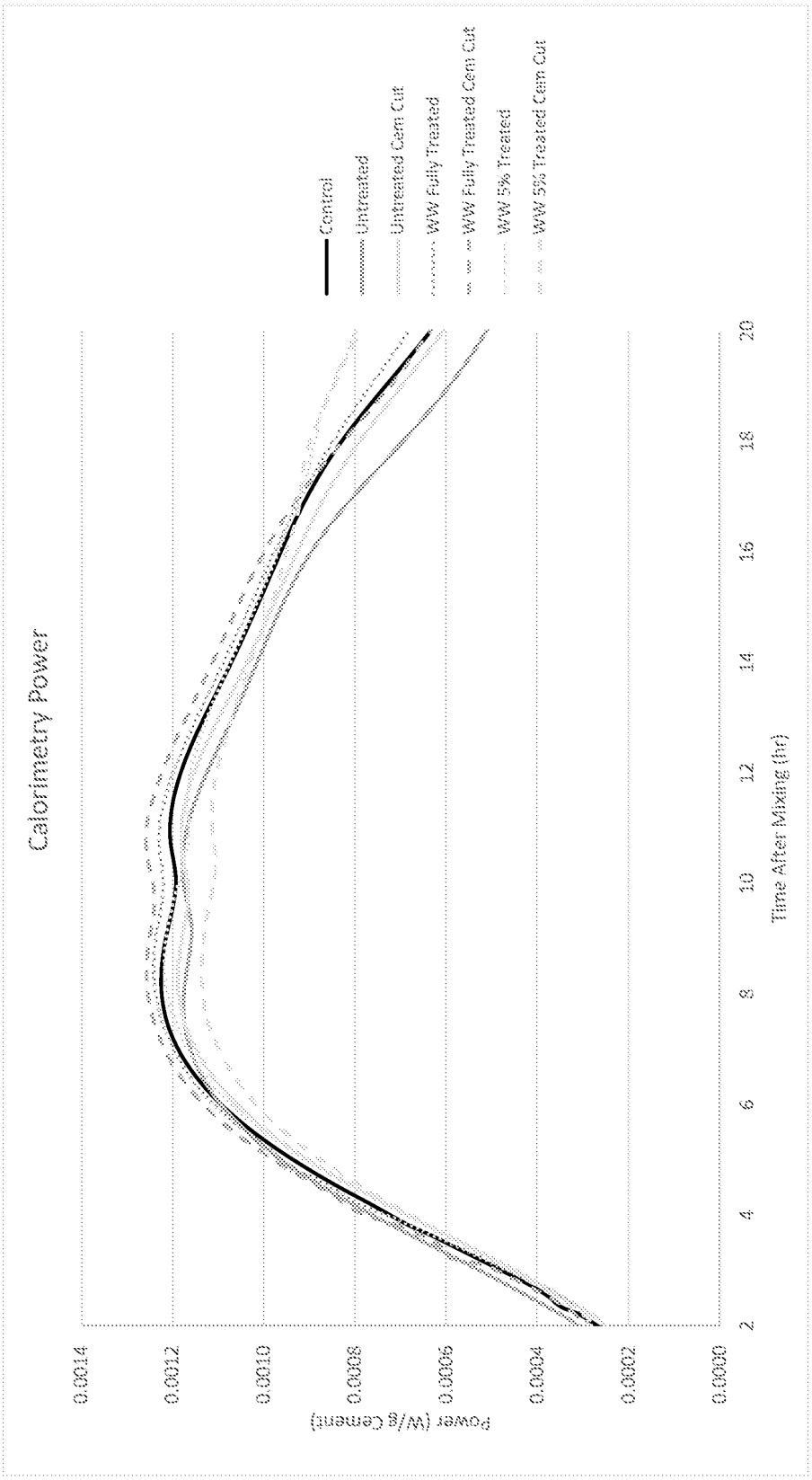
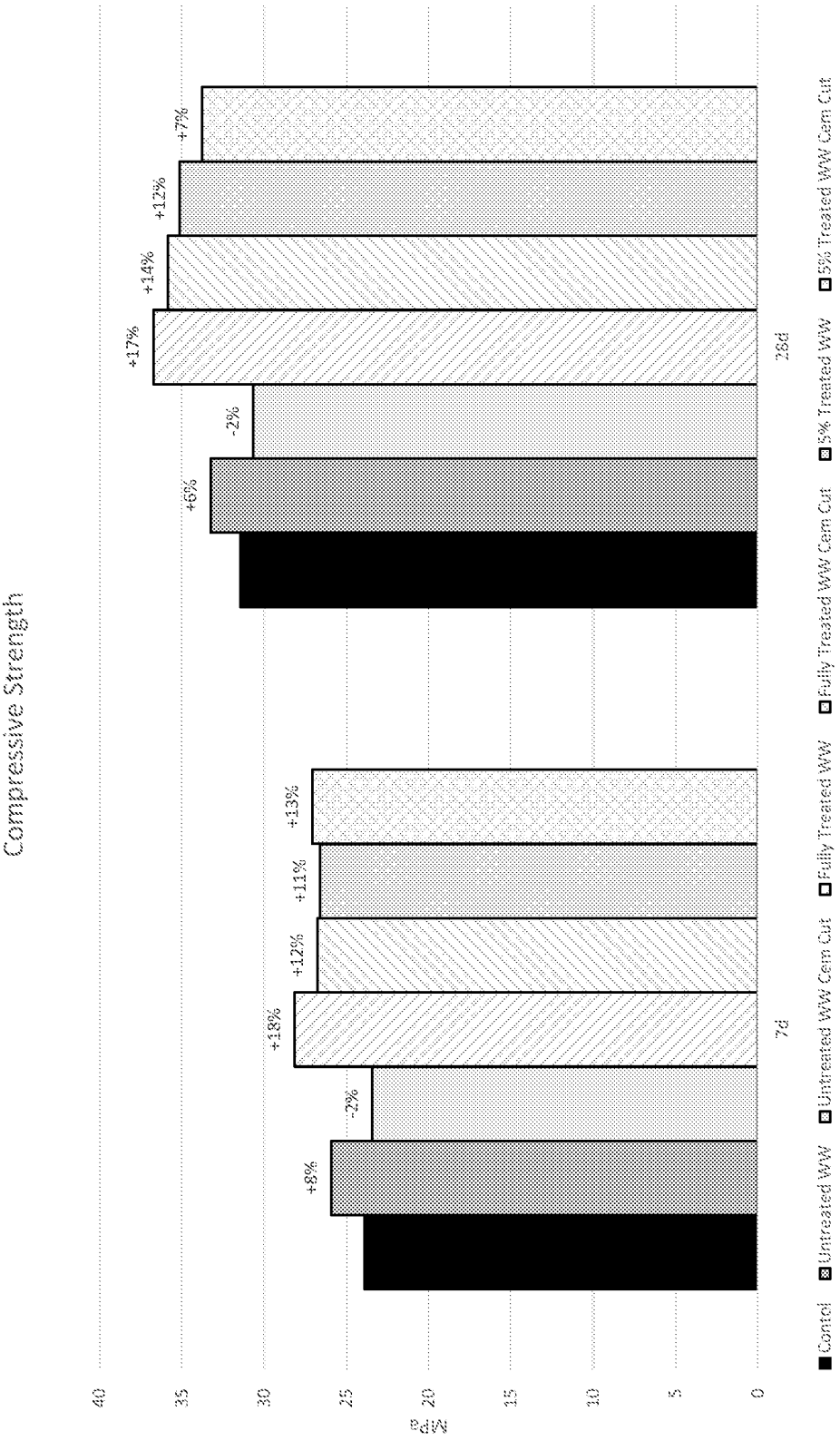

Calorimetry Power
Control
Untreated
Untreated Cem Cut
WW Fully Treated
WW Fully Treated Cem Cut
WW 5% Treated
WW 5% Treated Cem Cut
Power (W/g Cement)
0.0014
0.0012
0.0010
0.0008
0.0006
0.0004
0.0002
0.0000
Time After Mixing (hr)
2
4
6
8
10
12
14
16
18
20

Figure 108


Compressive Strength
psi
40
35
30
25
20
15
10
5
0
7d
28d
+8%
-2%
+18%
+12%
+11%
+13%
+6%
-2%
+17%
+14%
+12%
+7%
Control
Untreated WW
Untreated WW Cem Cut
Fully Treated WW
Fully Treated WW Cem Cut
5% Treated WW
5% Treated WW Cem Cut

# Figure 109

| Batch ID | Control | WWUT | WWUT - Cem | 5% WWT | 5% WWT - Cem | 25% WWT | 25% WWT - Cem |
|---|---|---|---|---|---|---|---|
| Cement Mass (kg) | 15 | 15 | 14.55 | 15 | 14.55 | 15 | 14.55 |
| Fly Ash (kg) | 5 | 5 | 4.85 | 5 | 4.85 | 5 | 4.85 |
| Coarse Aggregate Mass (kg) | 47.76 | 47.76 | 47.76 | 47.76 | 47.76 | 47.76 | 47.76 |
| Sand Mass (kg) | 39.07 | 39.07 | 39.07 | 39.07 | 39.07 | 39.07 | 39.07 |
| Water Mass (kg) | 3.68 | 0 | 0 | 0 | 0 | 0 | 0 |
| WW Mass (kg) | 0 | 4.24 | 4.24 | 4.24 | 4.24 | 4.24 | 4.24 |
| WW Solids Mass (kg) | 0 | 0.57 | 0.57 | 0.57 | 0.57 | 0.57 | 0.57 |
| w/c Ratio | 0.42 | 0.41 | 0.41 | 0.41 | 0.41 | 0.41 | 0.41 |

Figure 110

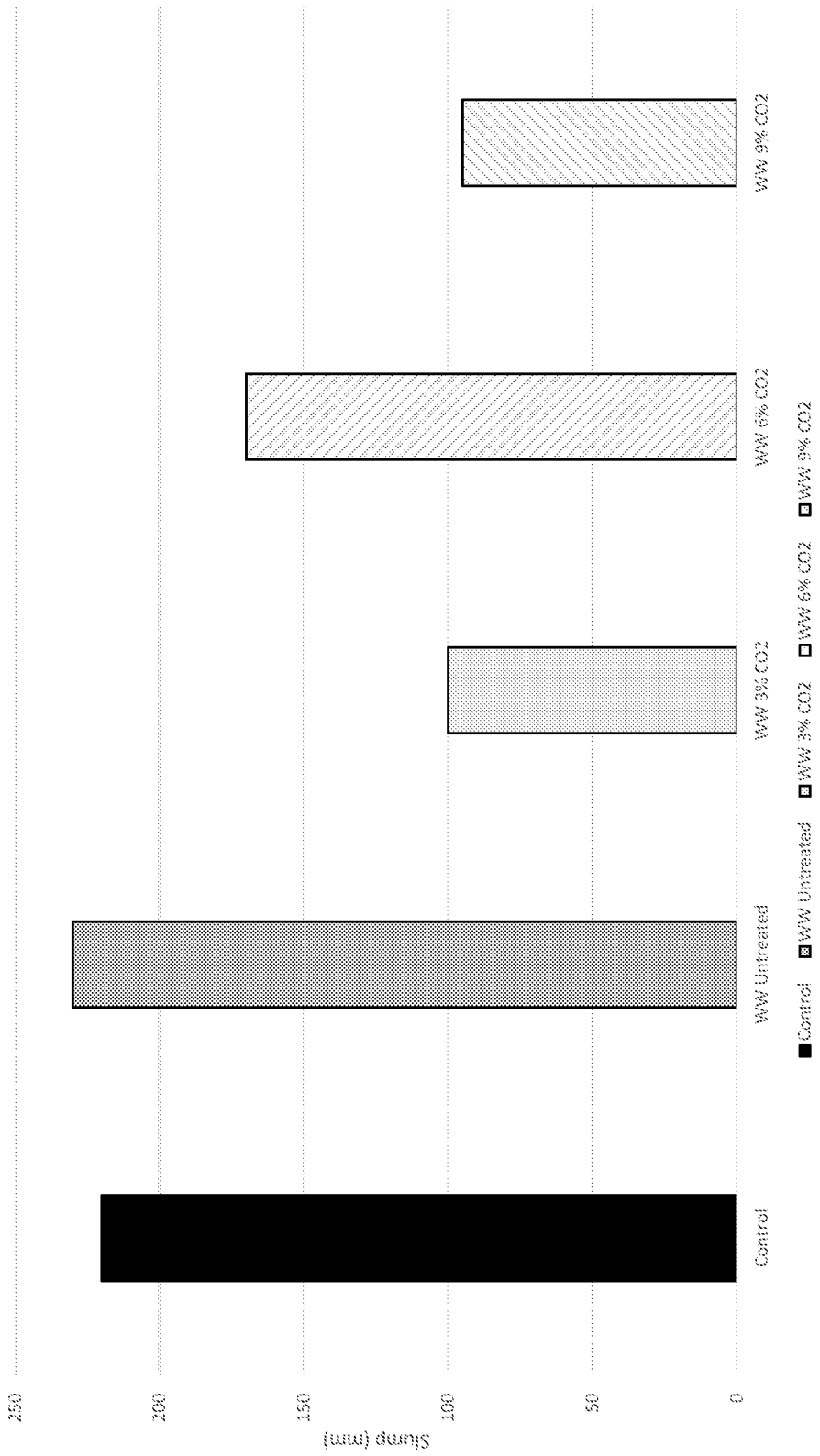

Slump (mm)
250
200
150
100
50
0
Control
WW Untreated
WW 3% CO2
WW 6% CO2
WW 9% CO2
Control
WW Untreated
WW 3% CO2
WW 6% CO2
WW 9% CO2

Figure 111

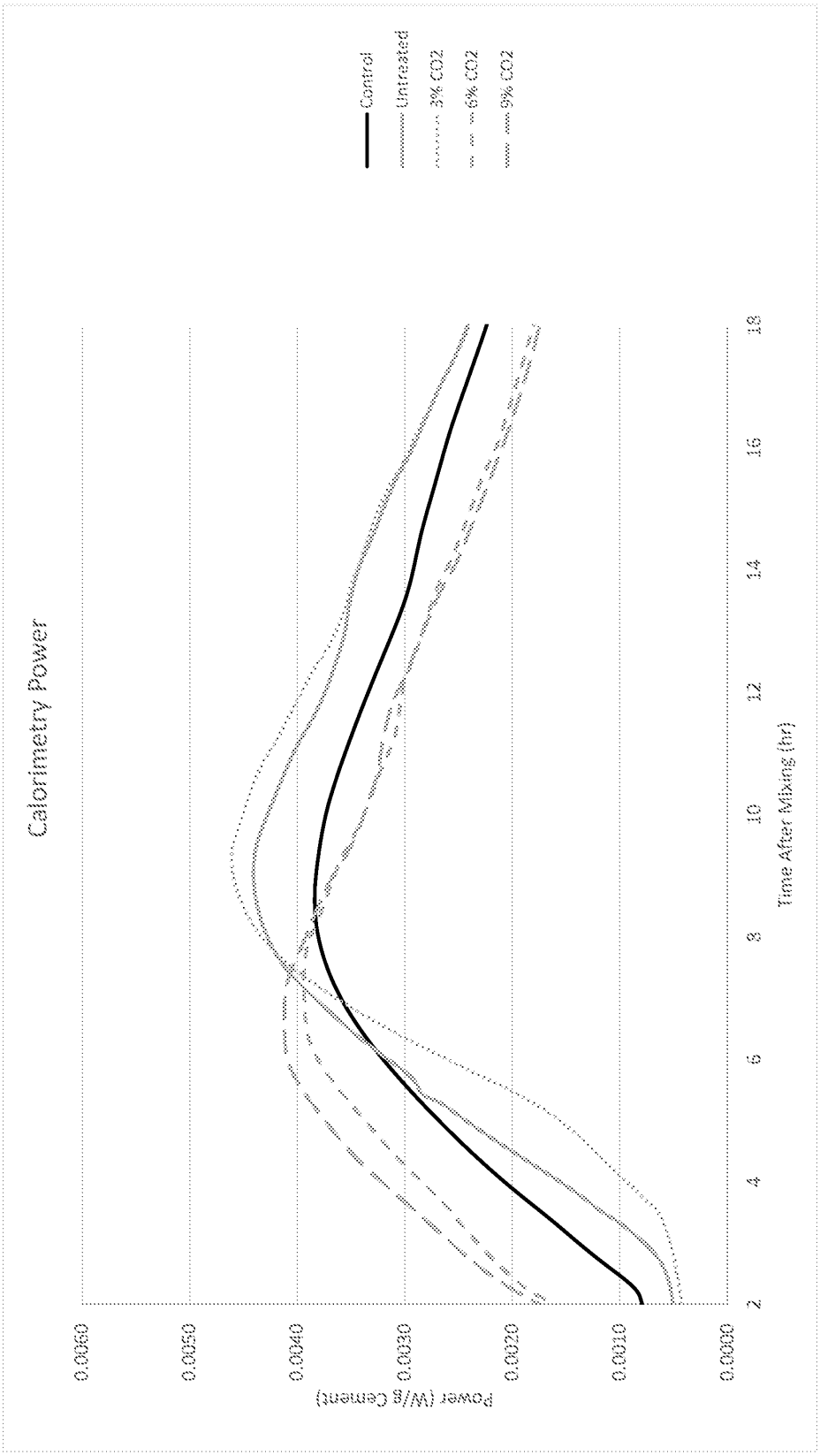
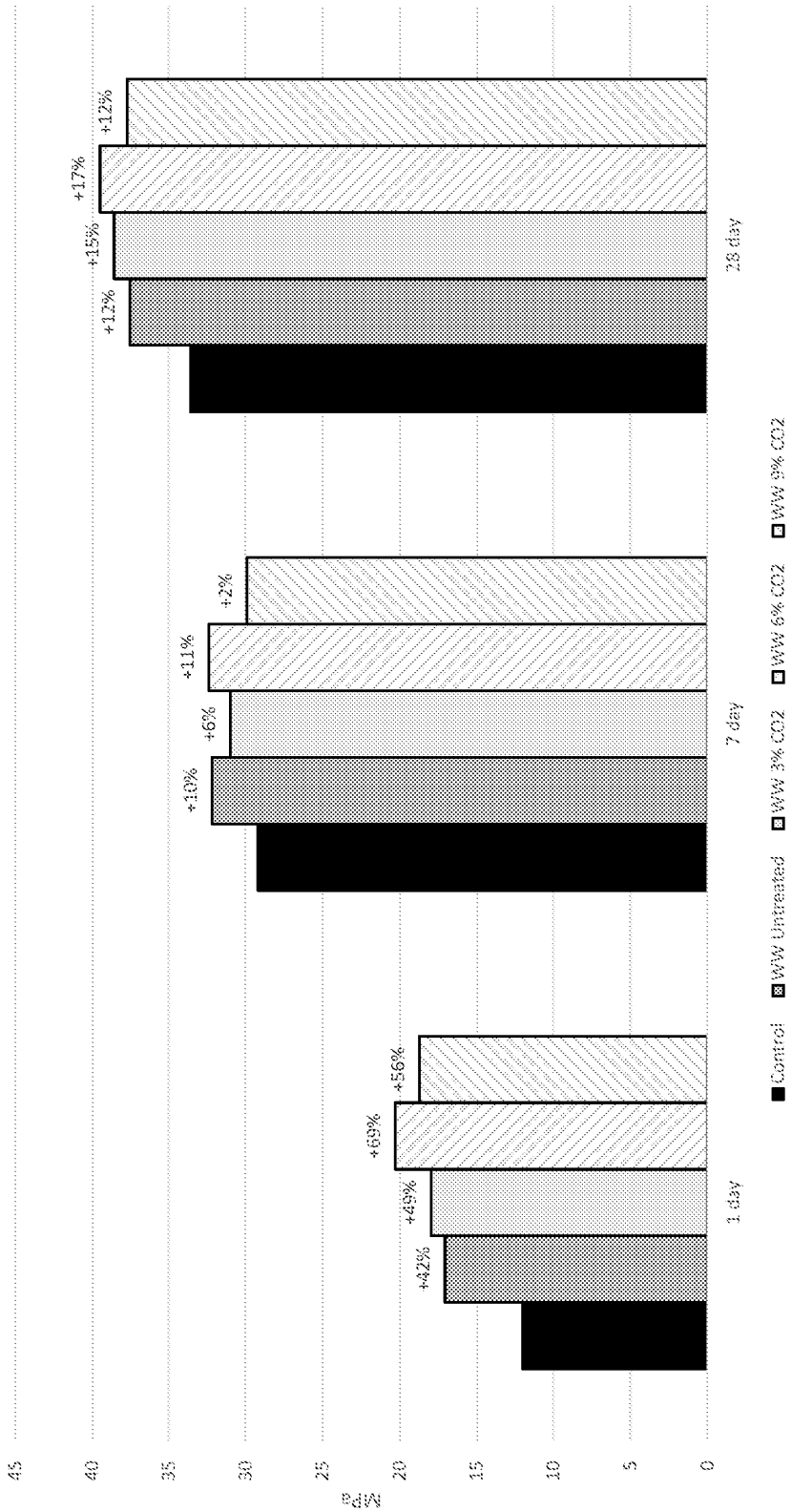

Calorimetry Power
Control
Untreated
3% CO2
6% CO2
9% CO2
Power (W/g Cement)
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
2
4
6
8
10
12
14
16
18
Time After Mixing (hr)

Figure 112


Compressive Strength
MPa
45
40
35
30
25
20
15
10
5
0
1 day
7 day
28 day
+56%
+69%
+49%
+42%
+2%
+11%
+6%
+10%
+12%
+17%
+15%
+12%
Control
WW Untreated
WW 3% CO2
WW 6% CO2
WW 9% CO2

# Figure 113

| Batch ID | Control | WWUT | 3% WWT | 6% WWT | 9% WWT |
|---|---|---|---|---|---|
| Cement Mass (kg) | 6.82 | 6.82 | 6.82 | 6.82 | 6.82 |
| Coarse Aggregate Mass (kg) | 23.85 | 23.85 | 23.85 | 23.85 | 23.85 |
| Sand Mass (kg) | 17.21 | 17.21 | 17.21 | 17.21 | 17.21 |
| Water Mass (kg) | 3.57 | 0 | 0 | 0 | 0 |
| WW Mass (kg) | 0 | 4.12 | 4.12 | 4.12 | 4.12 |
| WW Solids Mass (kg) | 0 | 0.55 | 0.55 | 0.55 | 0.55 |
| w/c Ratio | 0.63 | 0.58 | 0.58 | 0.58 | 0.58 |

Figure 114

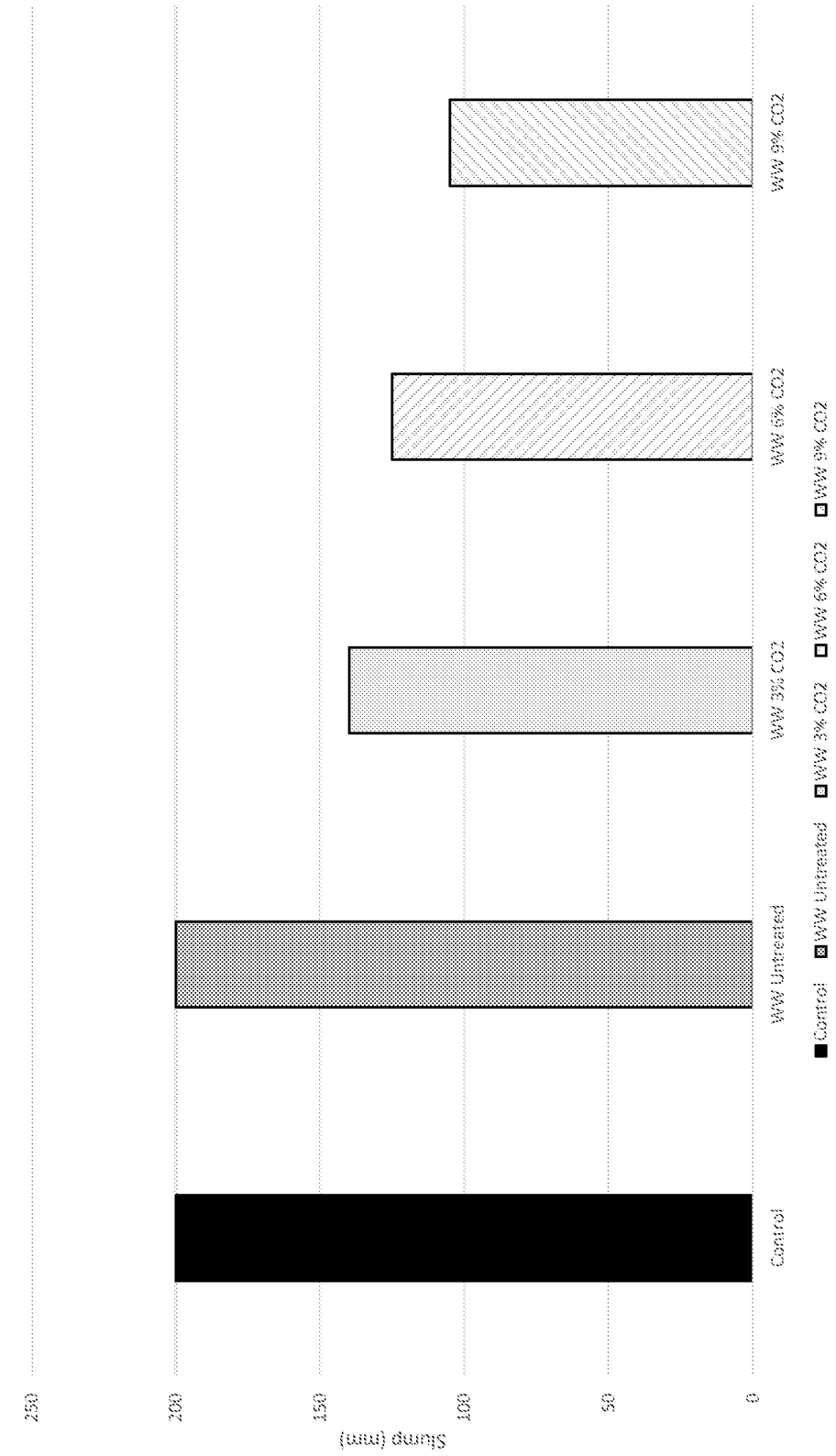

Slump (mm)
250
200
150
100
50
0
Control
WW Untreated
WW 3% CO2
WW 6% CO2
WW 9% CO2
Control
WW Untreated
WW 3% CO2
WW 6% CO2
WW 9% CO2

Figure 115

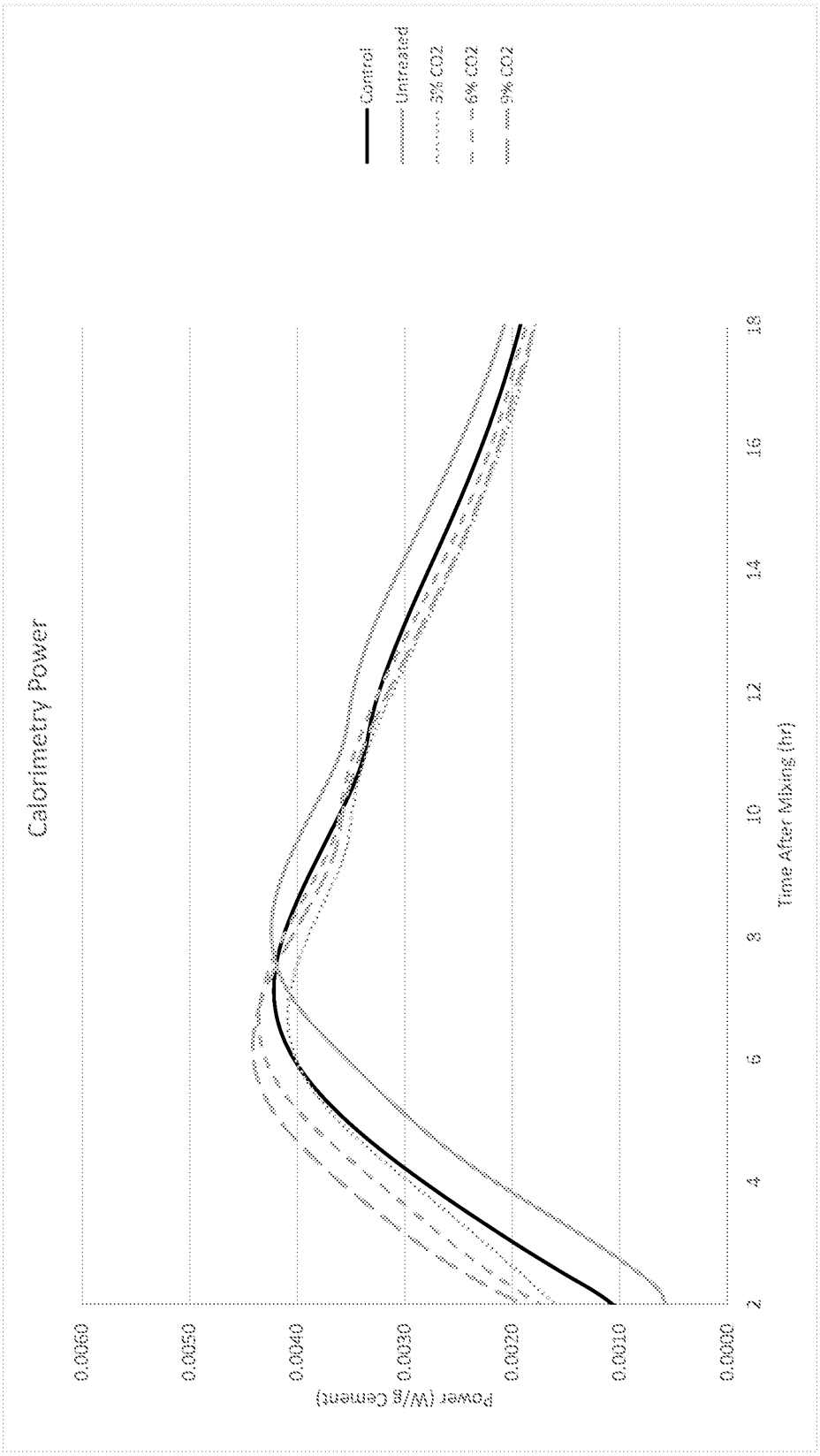
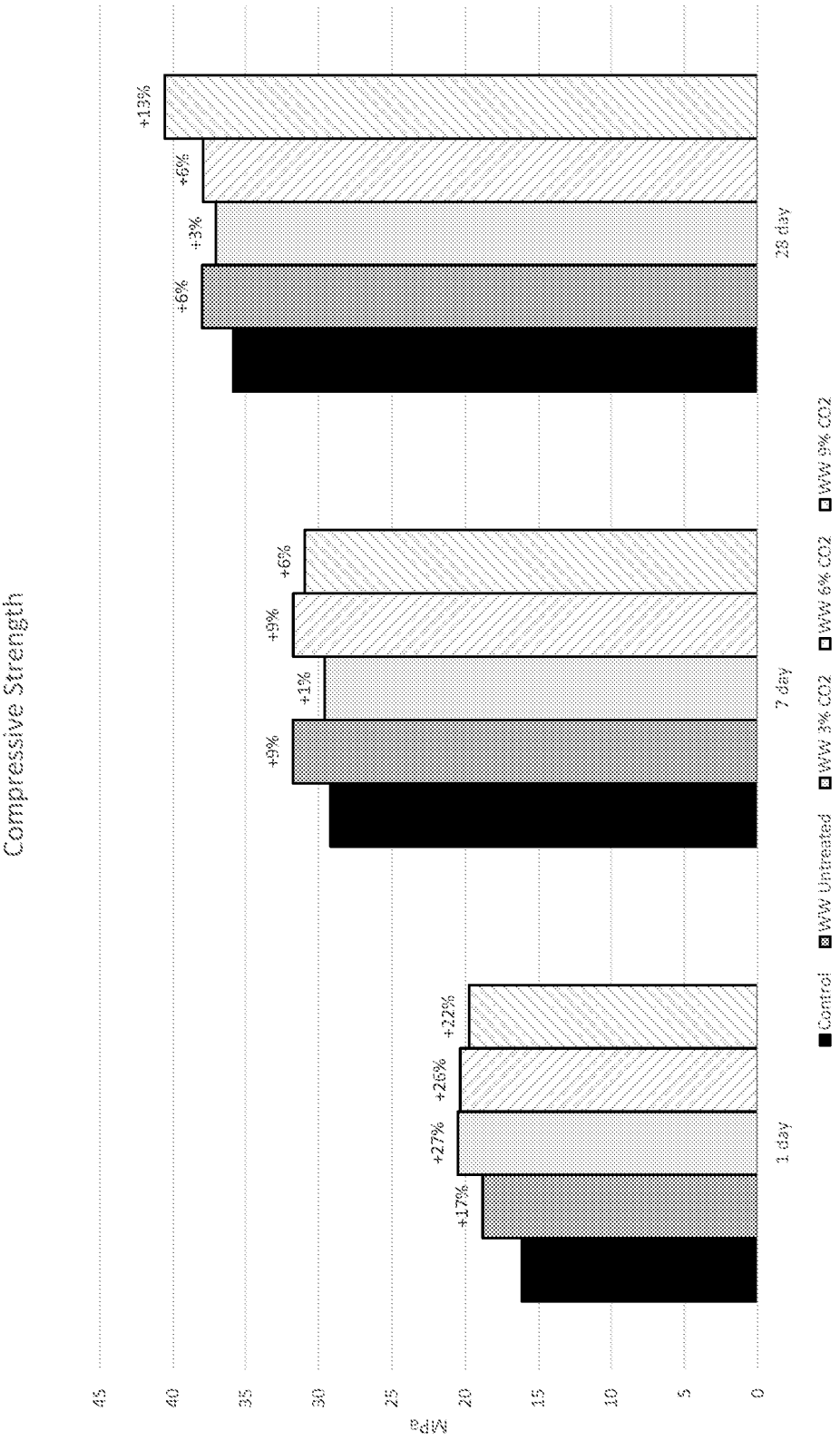

Calorimetry Power
Control
Untreated
3% CO2
6% CO2
9% CO2
Power (W/g Cement)
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
Time After Mixing (hr)
2
4
6
8
10
12
14
16
18

Figure 116


Compressive Strength
psi
45
40
35
30
25
20
15
10
5
0
1 day
7 day
28 day
+22%
+26%
+27%
+17%
+6%
+9%
+1%
+9%
+13%
+6%
+3%
+6%
Control
WW Untreated
WW 3% CO2
WW 6% CO2
WW 9% CO2

# Figure 117

| Batch ID | Control | WWUT | 3% WWT | 6% WWT | 9% WWT |
|---|---|---|---|---|---|
| Cement Mass (kg) | 6.82 | 6.82 | 6.82 | 6.82 | 6.82 |
| Coarse Aggregate Mass (kg) | 23.85 | 23.85 | 23.85 | 23.85 | 23.85 |
| Sand Mass (kg) | 17.21 | 17.21 | 17.21 | 17.21 | 17.21 |
| Water Mass (kg) | 3.57 | 0 | 0 | 0 | 0 |
| WW Mass (kg) | 0 | 4.12 | 4.12 | 4.12 | 4.12 |
| WW Solids Mass (kg) | 0 | 0.55 | 0.55 | 0.55 | 0.55 |
| w/c Ratio | 0.63 | 0.58 | 0.58 | 0.58 | 0.58 |

Figure 118

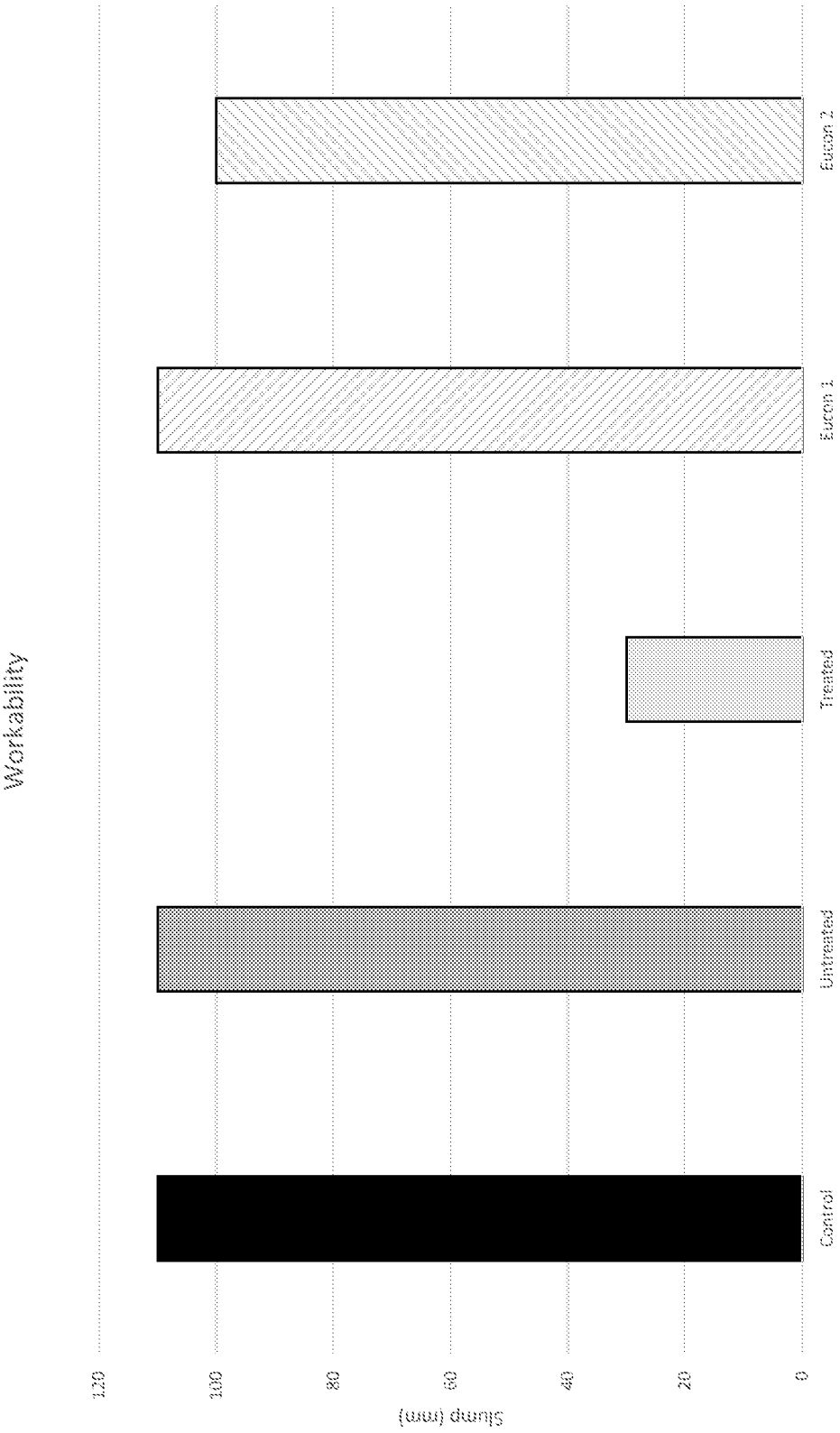

Workability
Slump (mm)
120
100
80
60
40
20
0
Control
Untreated
Treated
Eucon 1
Eucon 2

Figure 119

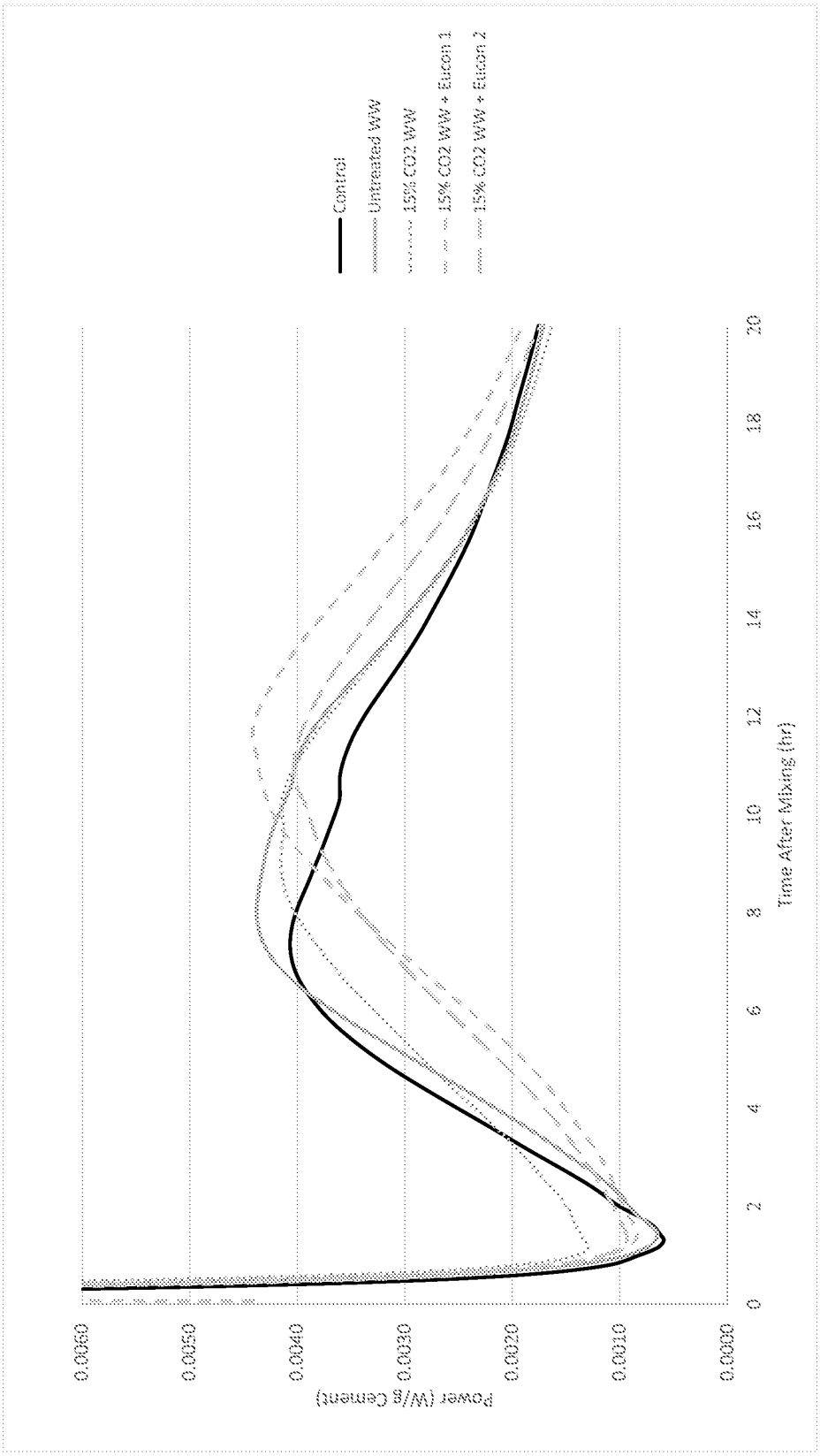
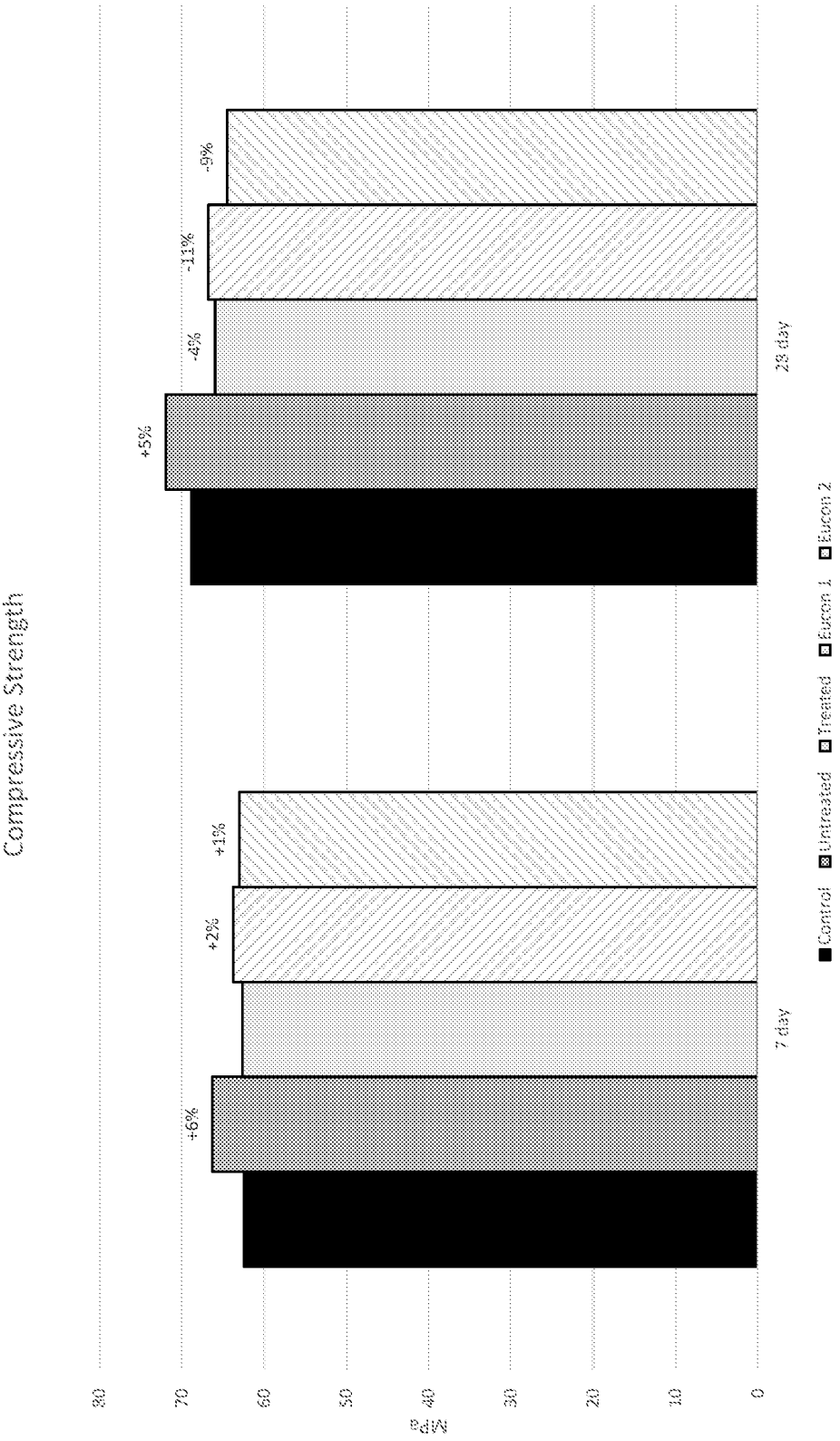

Control
Untreated WW
15% CO2 WW
15% CO2 WW + Eucon 1
15% CO2 WW + Eucon 2
Power (W/g Cement)
0.0060
0.0050
0.0040
0.0030
0.0020
0.0010
0.0000
0
2
4
6
8
10
12
14
16
18
20
Time After Mixing (hr)

Figure 120


Compressive Strength
MPa
80
70
60
50
40
30
20
10
0
+6%
+2%
+1%
7 day
+5%
-4%
-11%
-9%
28 day
Control
Untreated
Treated
Eucon 1
Eucon 2

# Figure 121

| Batch ID | Control | WWUT | WWT | WWT + Eucon 1 | WWT + Eucon 2 |
|---|---|---|---|---|---|
| Cement Mass (g) | 535 | 535 | 535 | 535 | 535 |
| Sand Mass (g) | 1350 | 1350 | 1350 | 1350 | 1350 |
| Water Mass (g) | 267.5 | 0 | 0 | 0 | 0 |
| WW Mass (g) | 0 | 308.6 | 308.6 | 308.6 | 308.6 |
| WW Solids Mass (g) | 0 | 41.1 | 41.1 | 41.1 | 41.1 |
| w/c Ratio | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 |

Figure 122

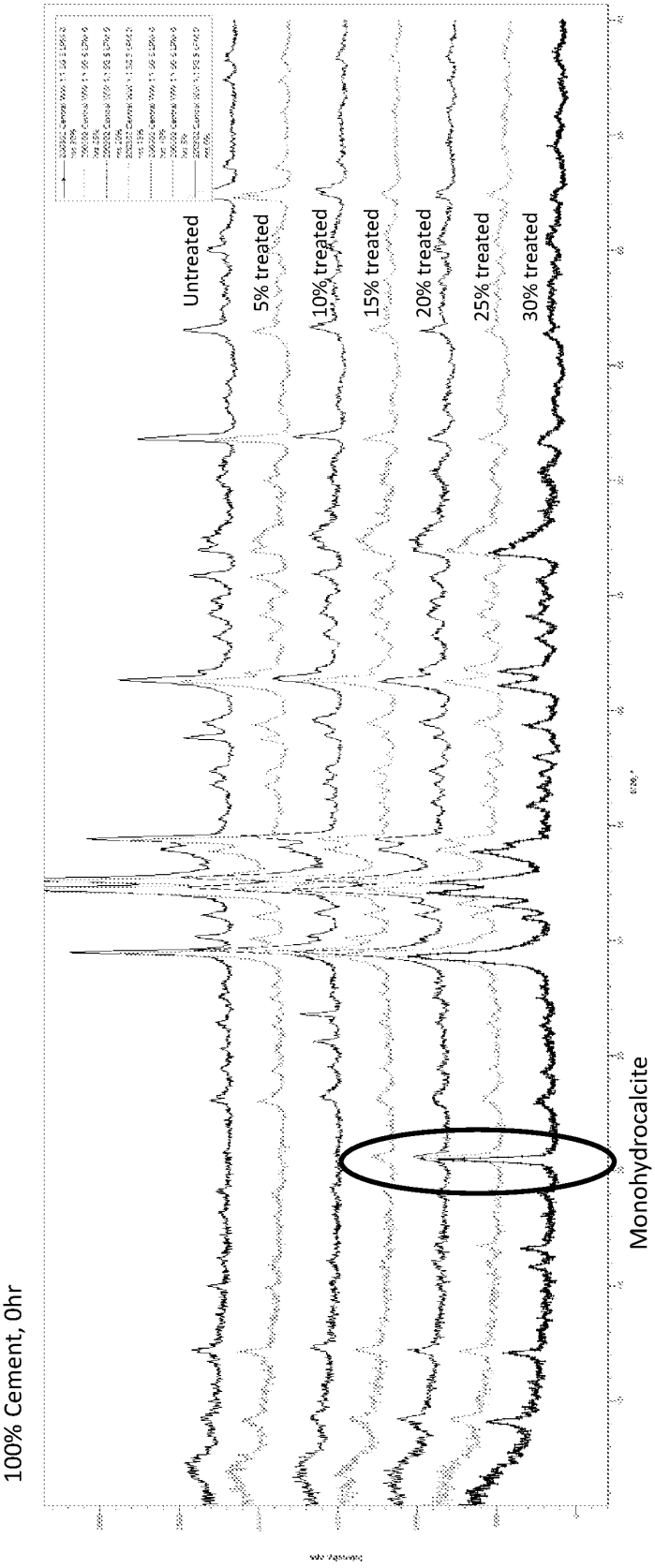

100% Cement, 0hr
Untreated
5% treated
10% treated
15% treated
20% treated
25% treated
30% treated
Monohydrocalcite

Figure 123

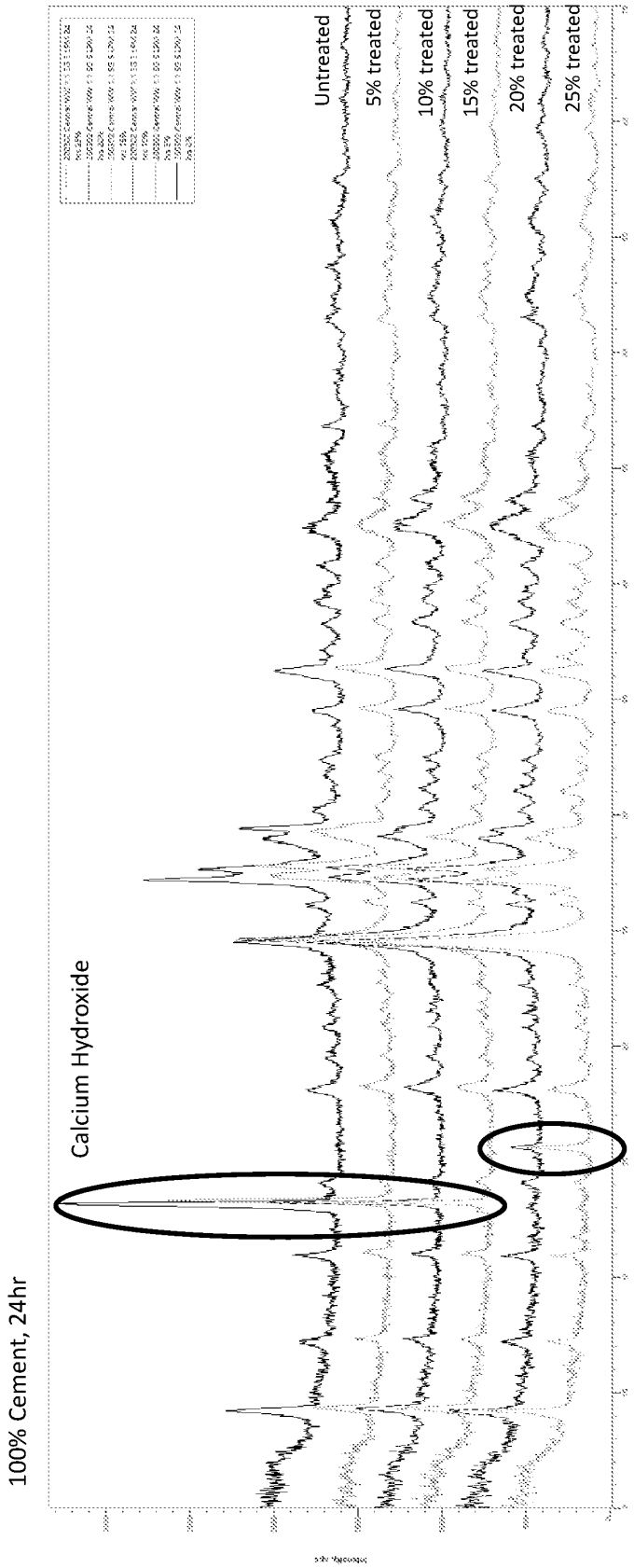

100% Cement, 24hr
Calcium Hydroxide
Monohydrocalcite
Untreated
5% treated
10% treated
15% treated
20% treated
25% treated

Figure 124

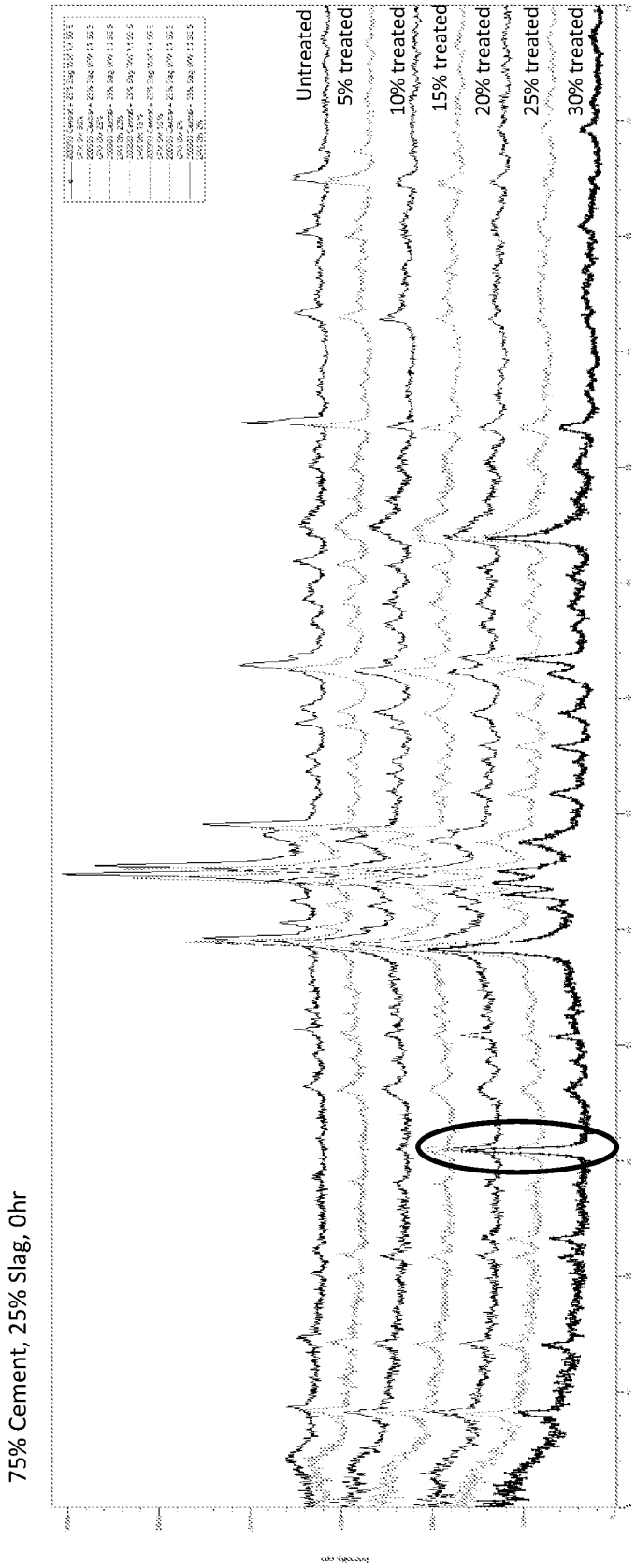

75% Cement, 25% Slag, 0hr
Untreated
5% treated
10% treated
15% treated
20% treated
25% treated
30% treated
Monohydrocalcite

Figure 125

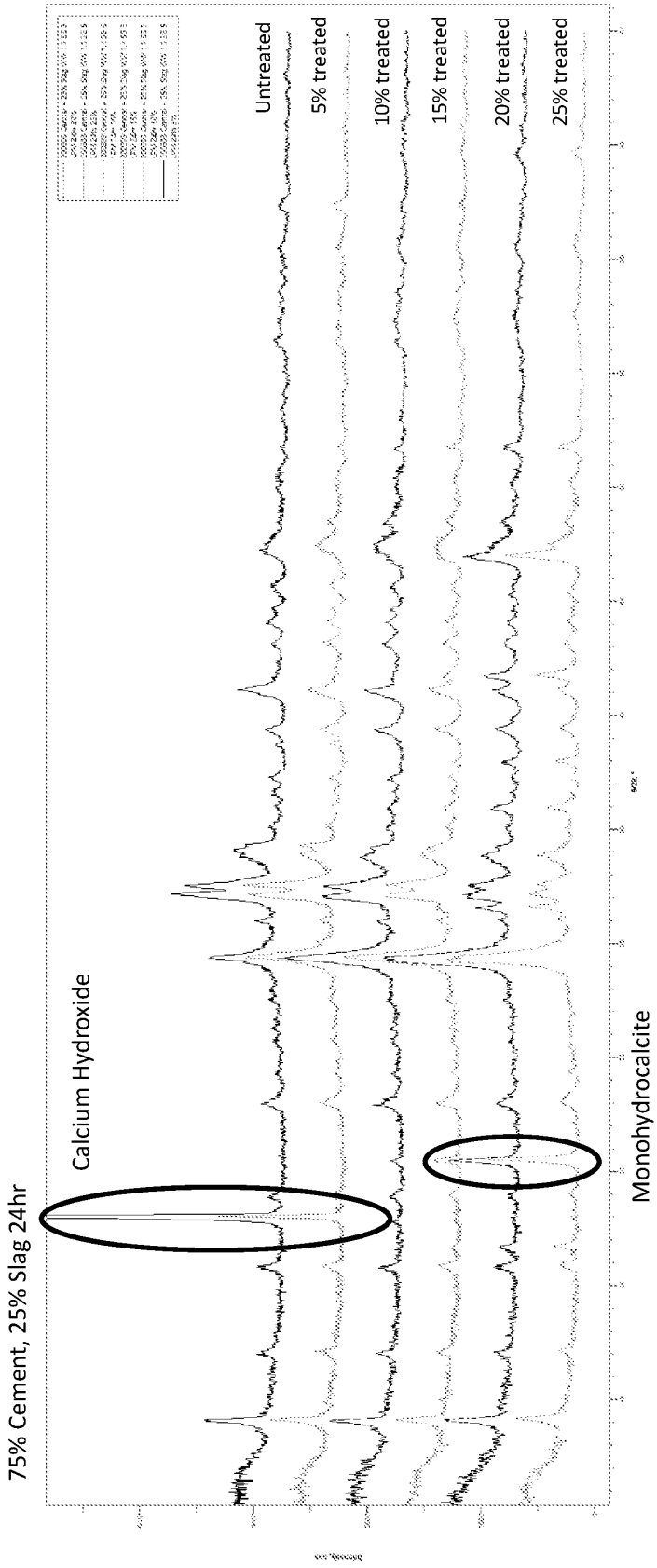

75% Cement, 25% Slag 24hr
Calcium Hydroxide
Monohydrocalcite
Untreated
5% treated
10% treated
15% treated
20% treated
25% treated

Figure 126

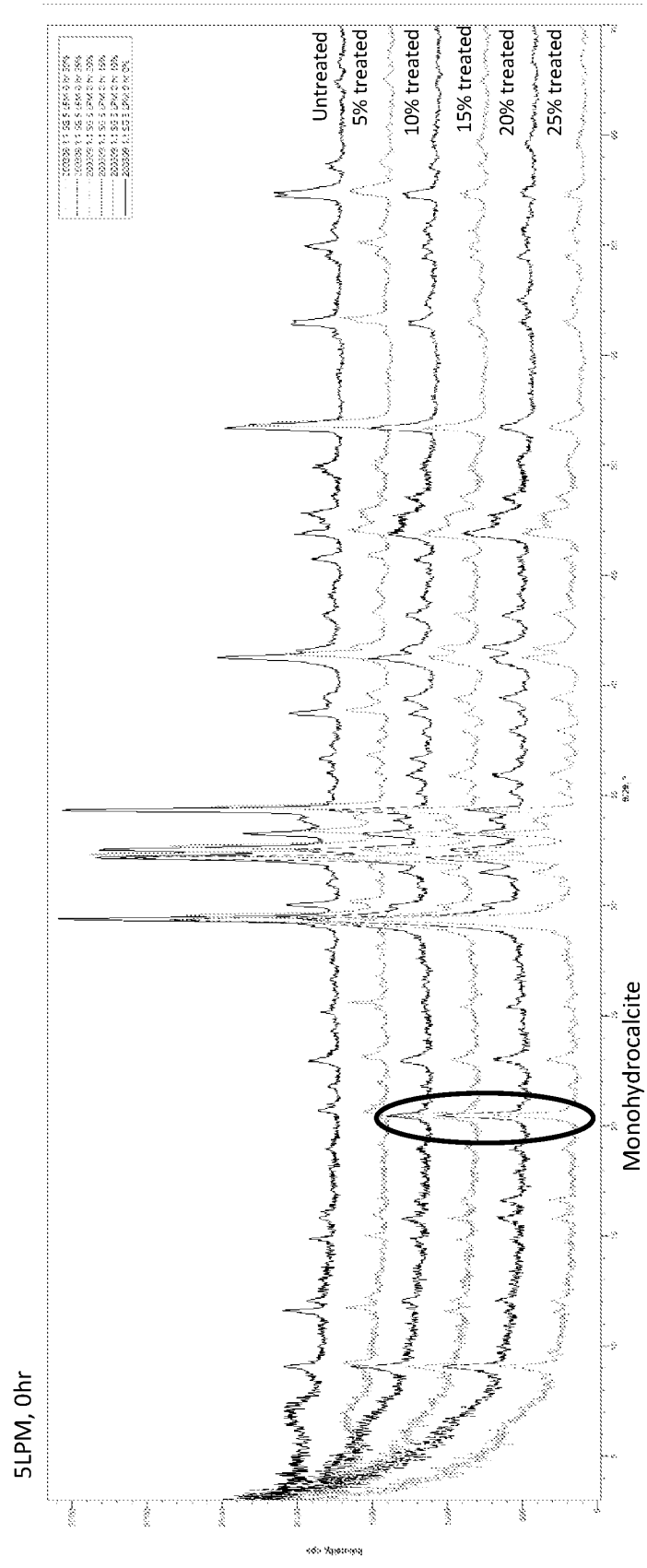

Untreated
5% treated
10% treated
15% treated
20% treated
25% treated
Monohydrocalcite
5LPM, 0hr

Figure 127

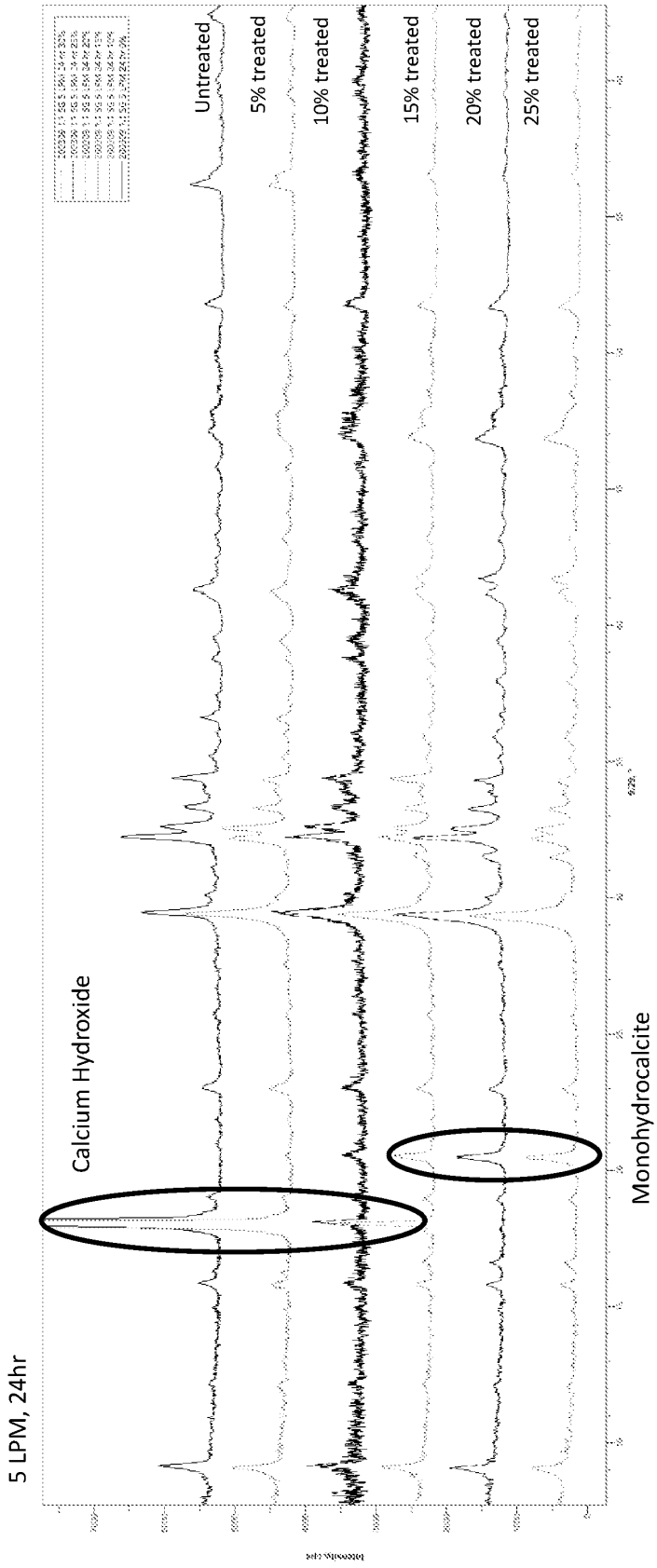

5 LPM, 24hr
Calcium Hydroxide
Monohydrocalcite
Untreated
5% treated
10% treated
15% treated
20% treated
25% treated

Figure 128

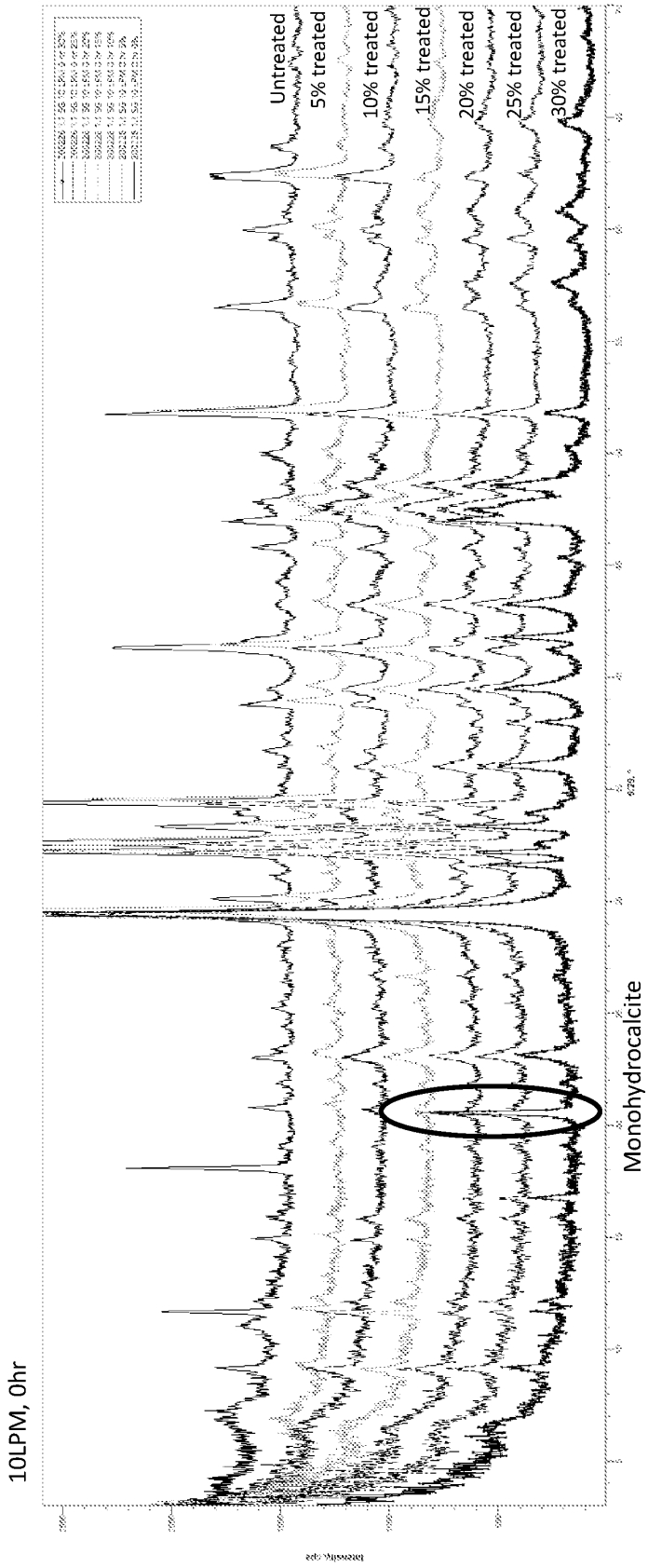

10LPM, 0hr
Untreated
5% treated
10% treated
15% treated
20% treated
25% treated
30% treated
Monohydrocalcite

Figure 129

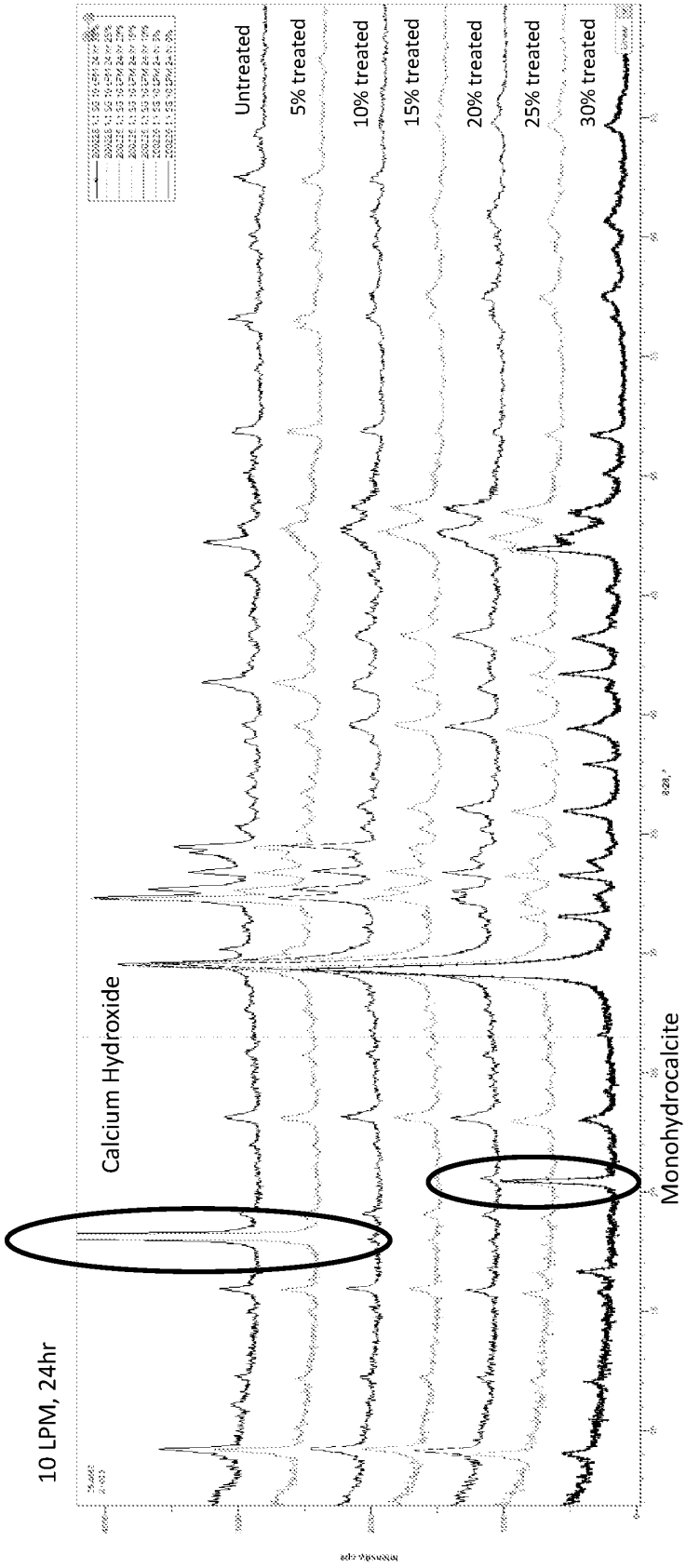

10 LPM, 24hr
Calcium Hydroxide
Monohydrocalcite
Untreated
5% treated
10% treated
15% treated
20% treated
25% treated
30% treated

Figure 130

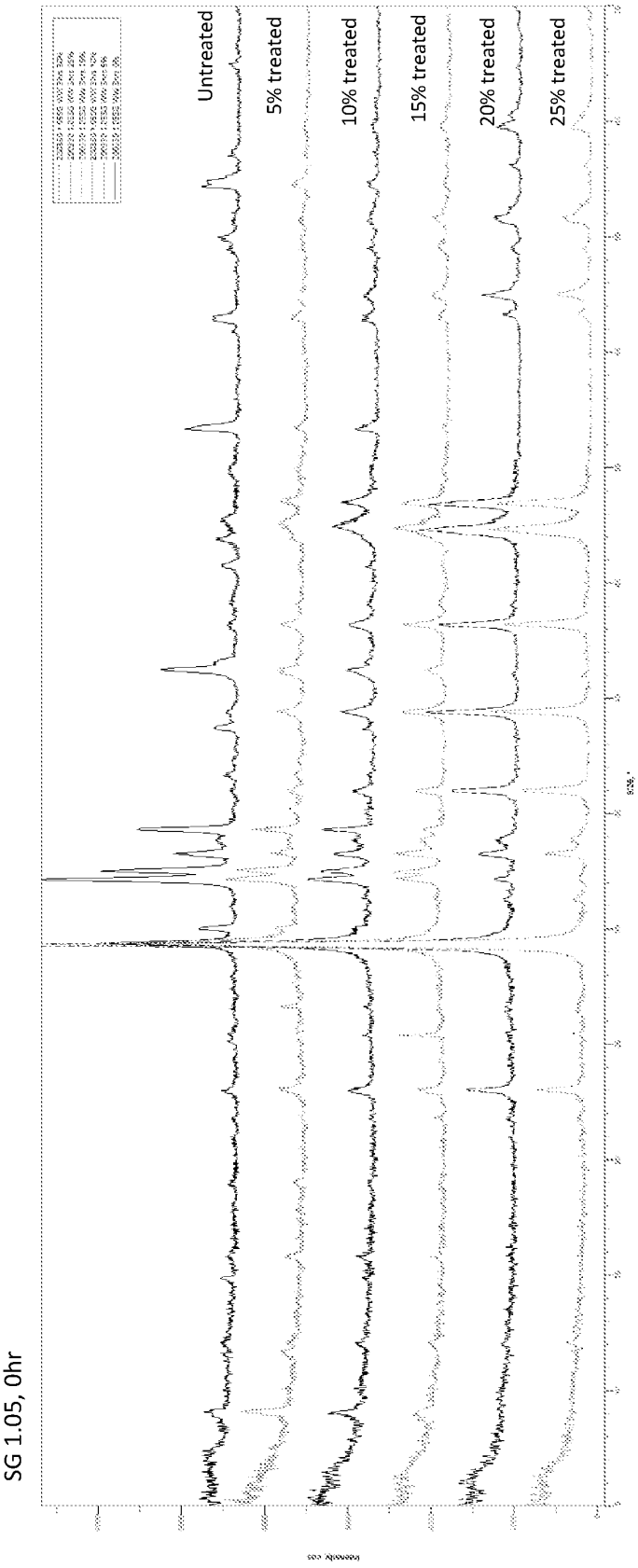

SG 1.05, 0hr
Untreated
5% treated
10% treated
15% treated
20% treated
25% treated

Figure 131

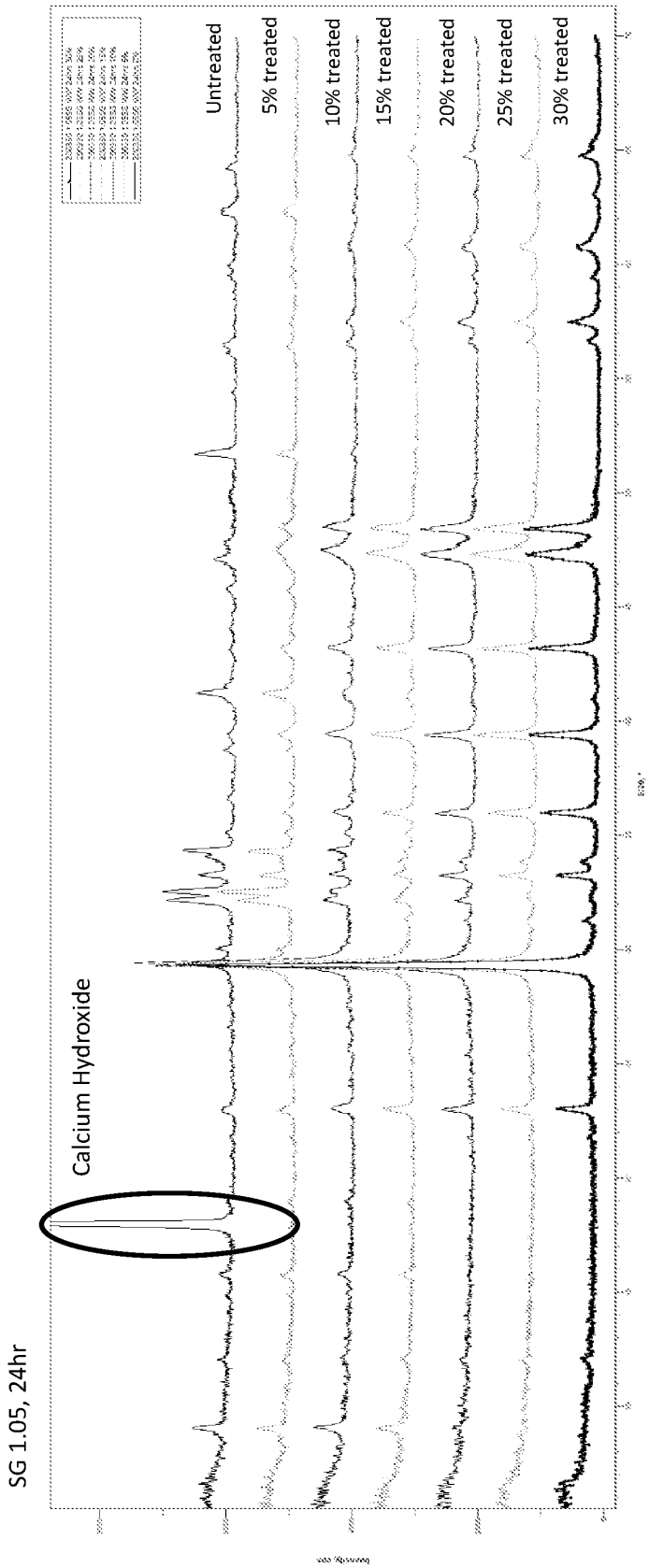

SG 1.05, 24hr
Calcium Hydroxide
Untreated
5% treated
10% treated
15% treated
20% treated
25% treated
30% treated

Figure 132

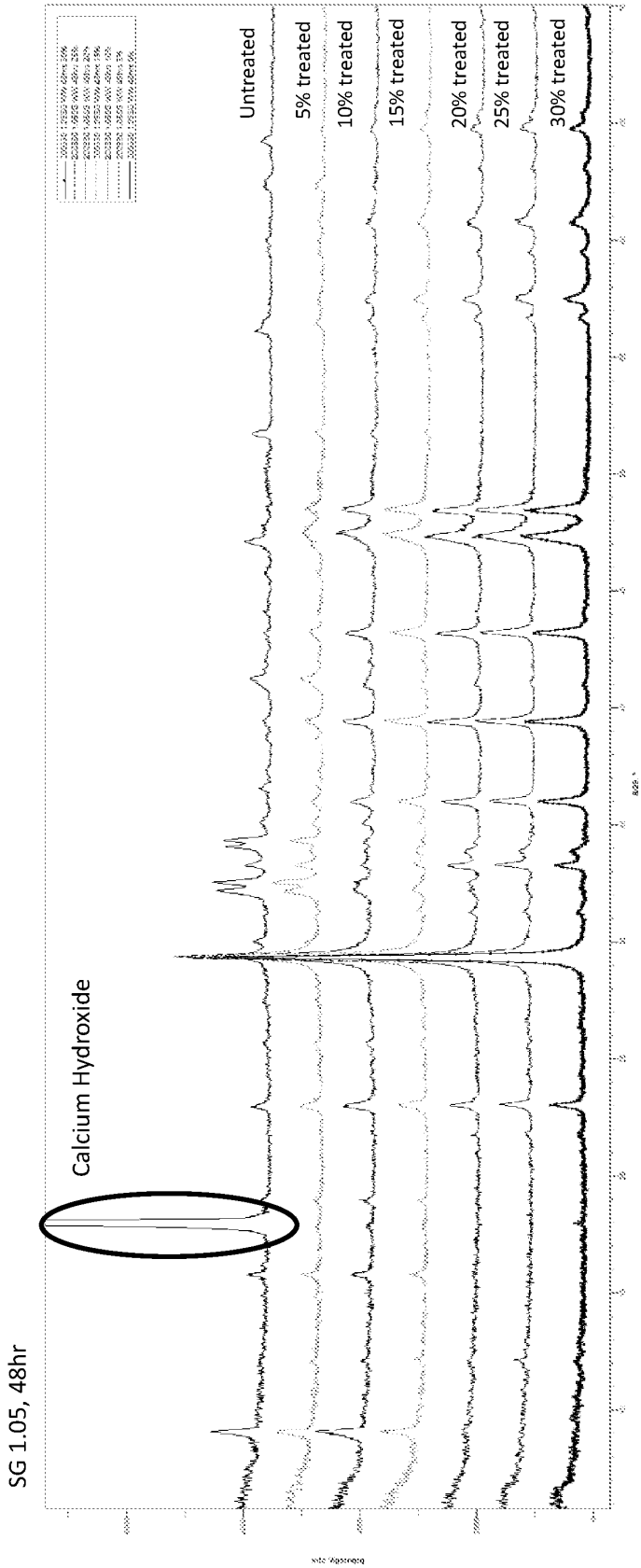

SG 1.05, 48hr
Calcium Hydroxide
Untreated
5% treated
10% treated
15% treated
20% treated
25% treated
30% treated

Figure 133

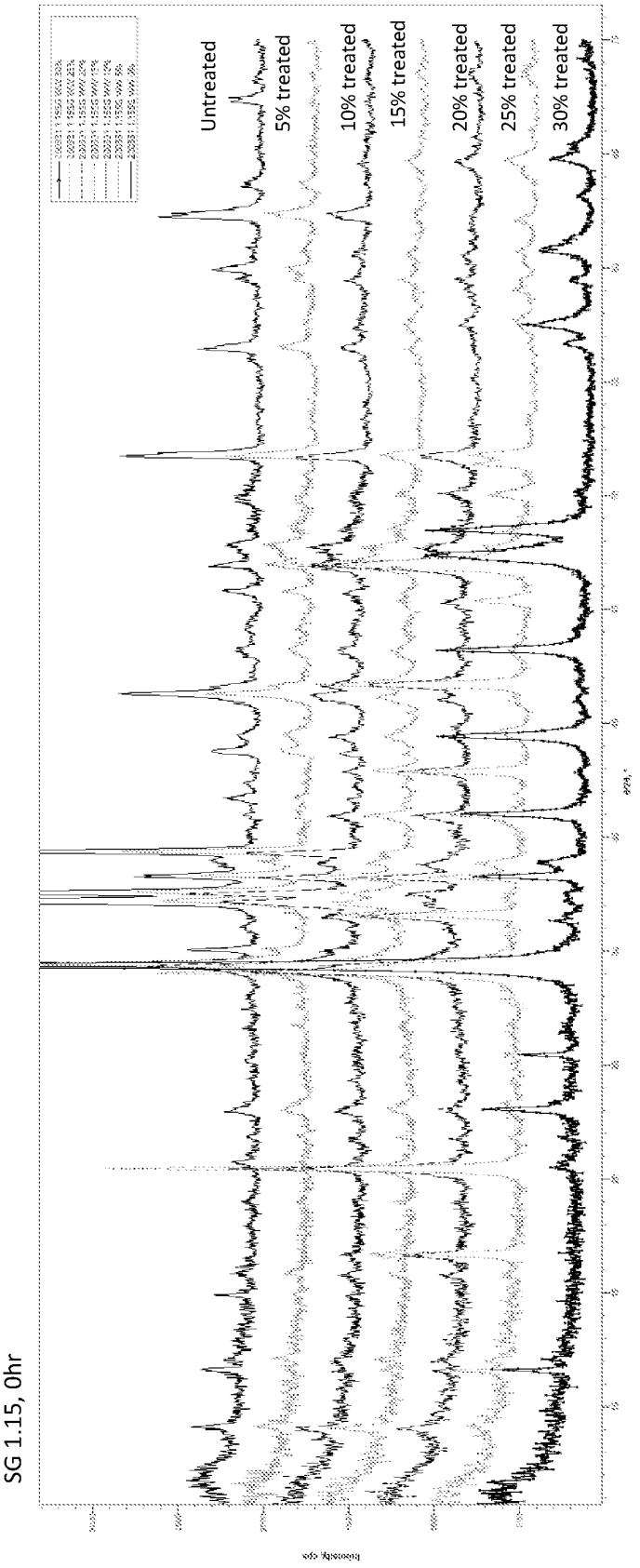

SG 1.15, 0hr
Untreated
5% treated
10% treated
15% treated
20% treated
25% treated
30% treated

Figure 134

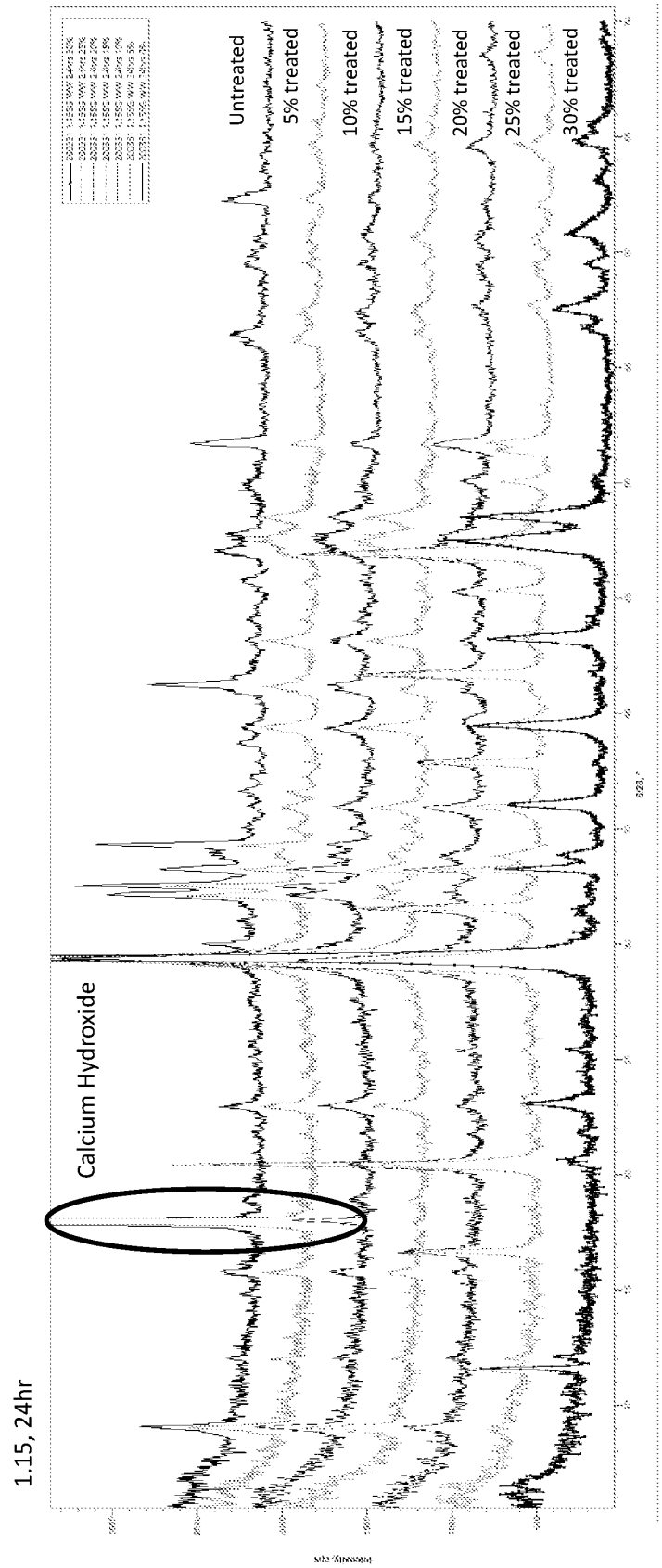
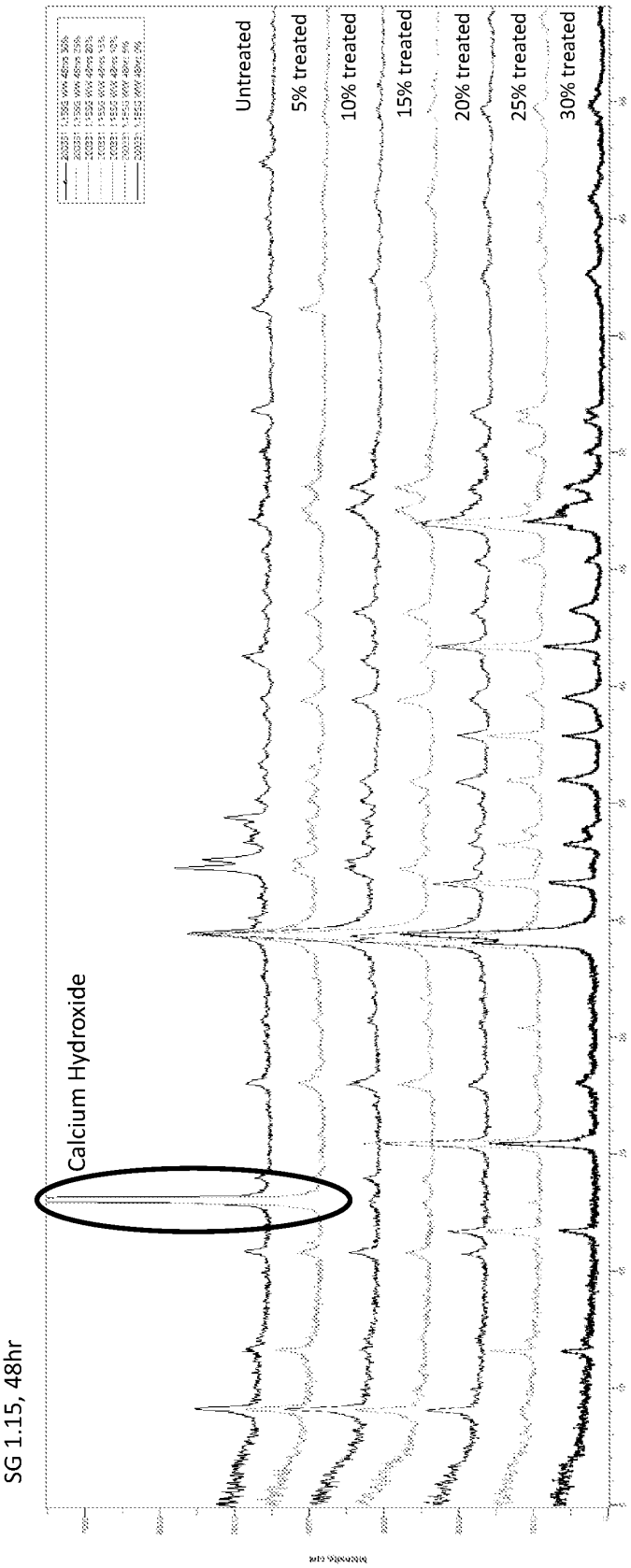

1.15, 24hr
Calcium Hydroxide
Untreated
5% treated
10% treated
15% treated
20% treated
25% treated
30% treated

Figure 135


SG 1.15, 48hr
Calcium Hydroxide
Untreated
5% treated
10% treated
15% treated
20% treated
25% treated
30% treated