FIG. 1

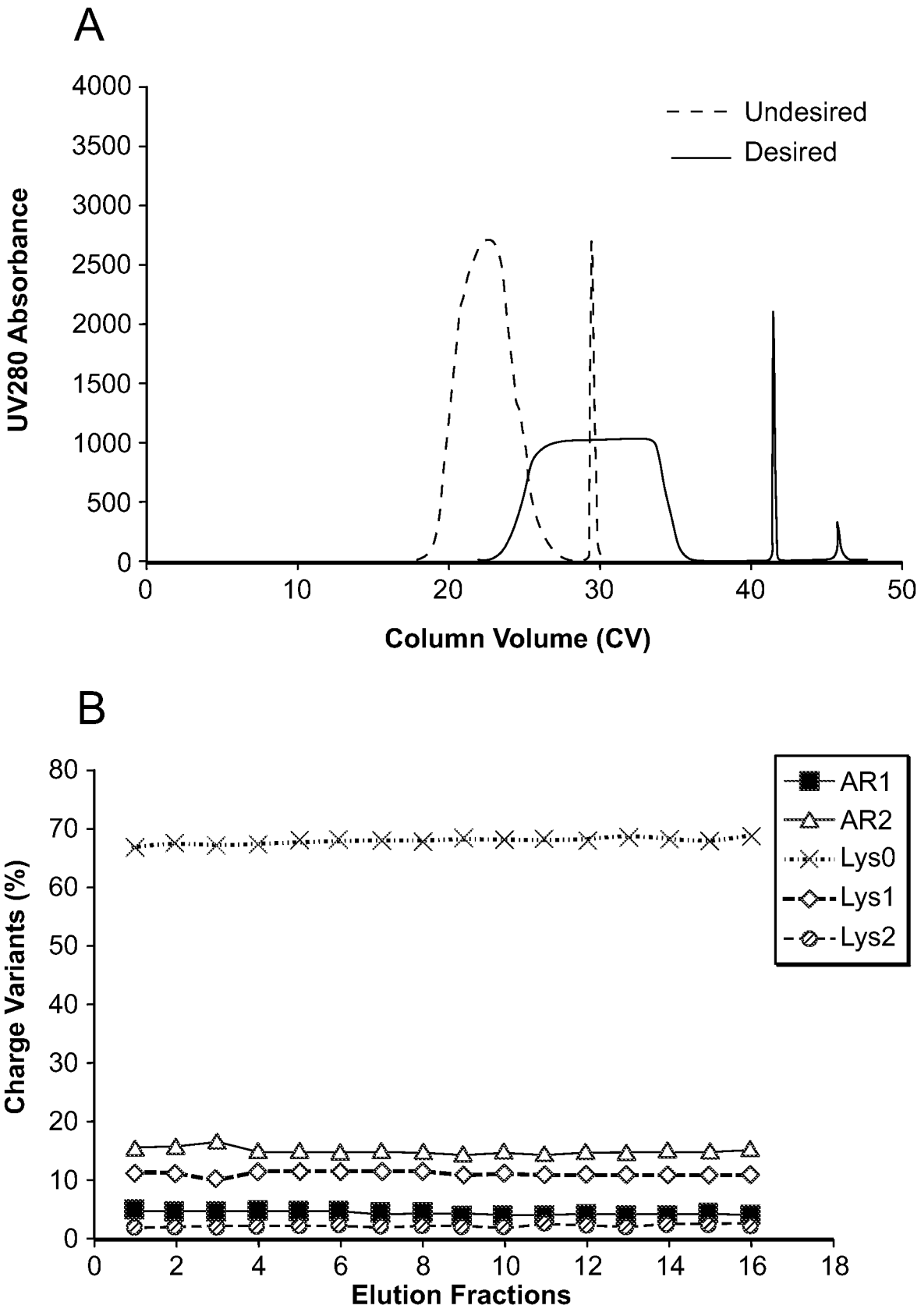

A
4000
3500
3000
2500
2000
1500
1000
500
0
UV280 Absorbance
Undesired
Desired
0
10
20
30
40
50
Column Volume (CV)
B
80
70
60
50
40
30
20
10
0
Charge Variants (%)
AR1
AR2
Lys0
Lys1
Lys2
0
2
4
6
8
10
12
14
16
18
Elution Fractions

FIG. 2

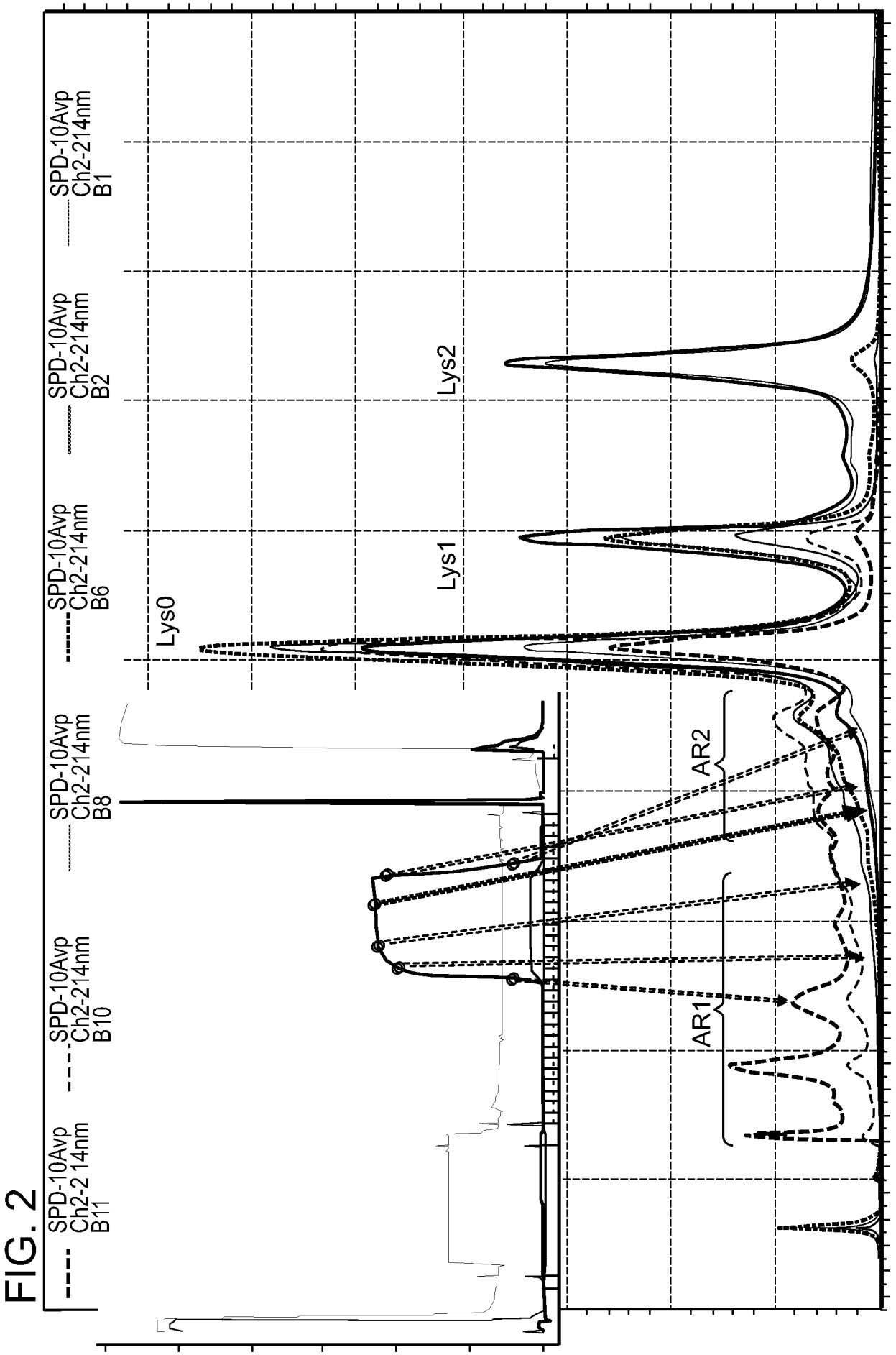

SPD-10Avp Ch2-214nm B1
SPD-10Avp Ch2-214nm B2
SPD-10Avp Ch2-214nm B6
SPD-10Avp Ch2-214nm B8
SPD-10Avp Ch2-214nm B10
SPD-10Avp Ch2-214nm B11
Lys0
Lys1
Lys2
AR1
AR2

FIG. 3

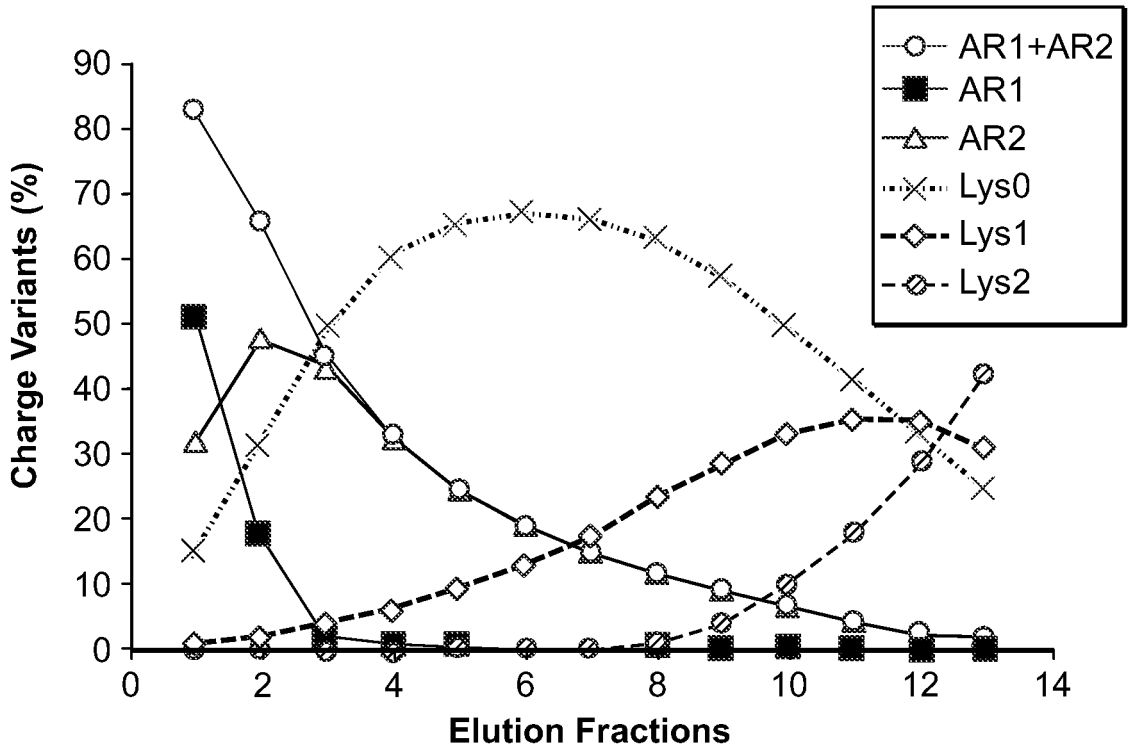

AR1+AR2
AR1
AR2
Lys0
Lys1
Lys2
Charge Variants (%)
Elution Fractions
0
10
20
30
40
50
60
70
80
90
0
2
4
6
8
10
12
14

FIG. 4

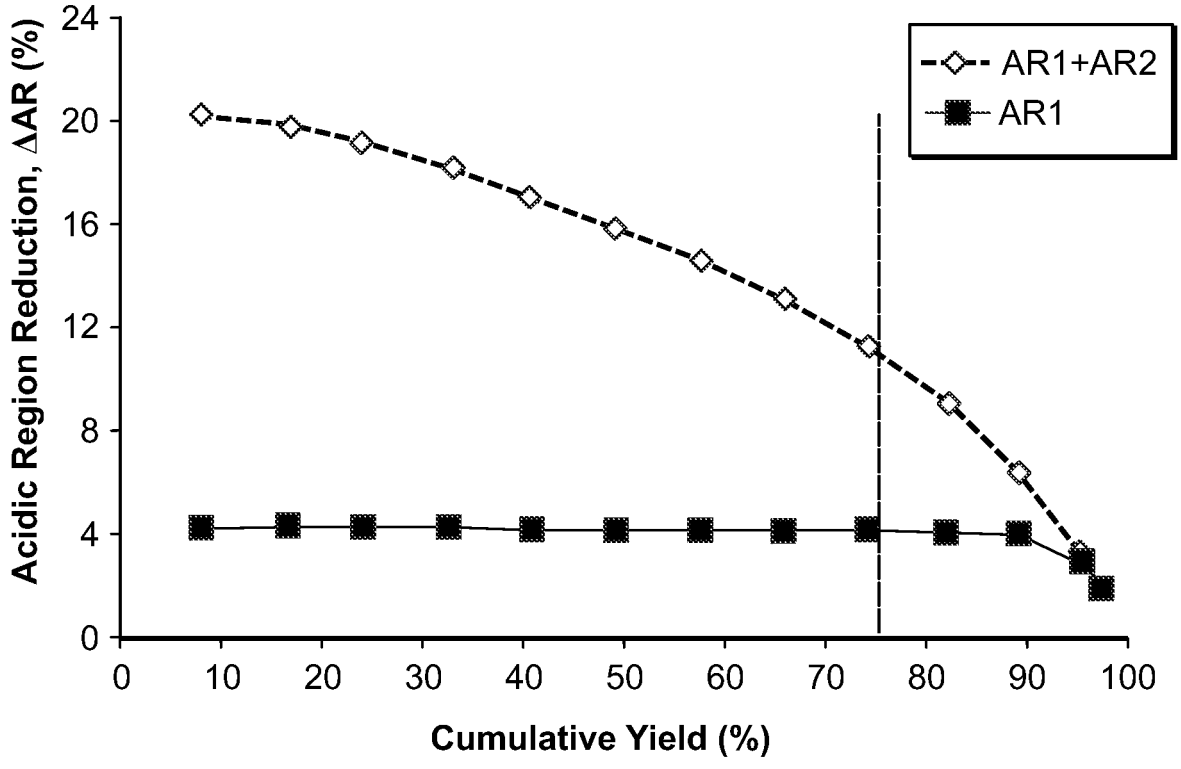

AR1+AR2
AR1
Acidic Region Reduction, ΔAR (%)
Cumulative Yield (%)
0
4
8
12
16
20
24
0
10
20
30
40
50
60
70
80
90
100

FIG. 5

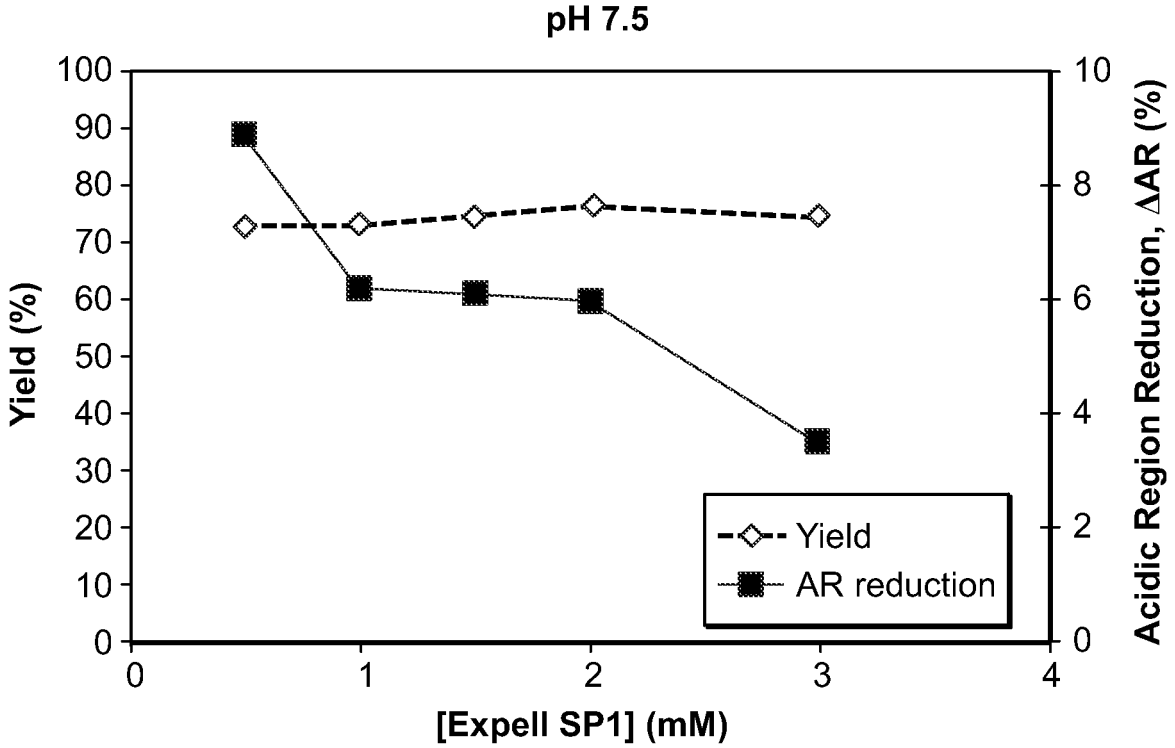

pH 7.5
Yield (%)
Acidic Region Reduction, ΔAR (%)
[Expell SP1] (mM)
Yield
AR reduction
0
10
20
30
40
50
60
70
80
90
100
0
2
4
6
8
10
0
1
2
3
4

FIG. 6

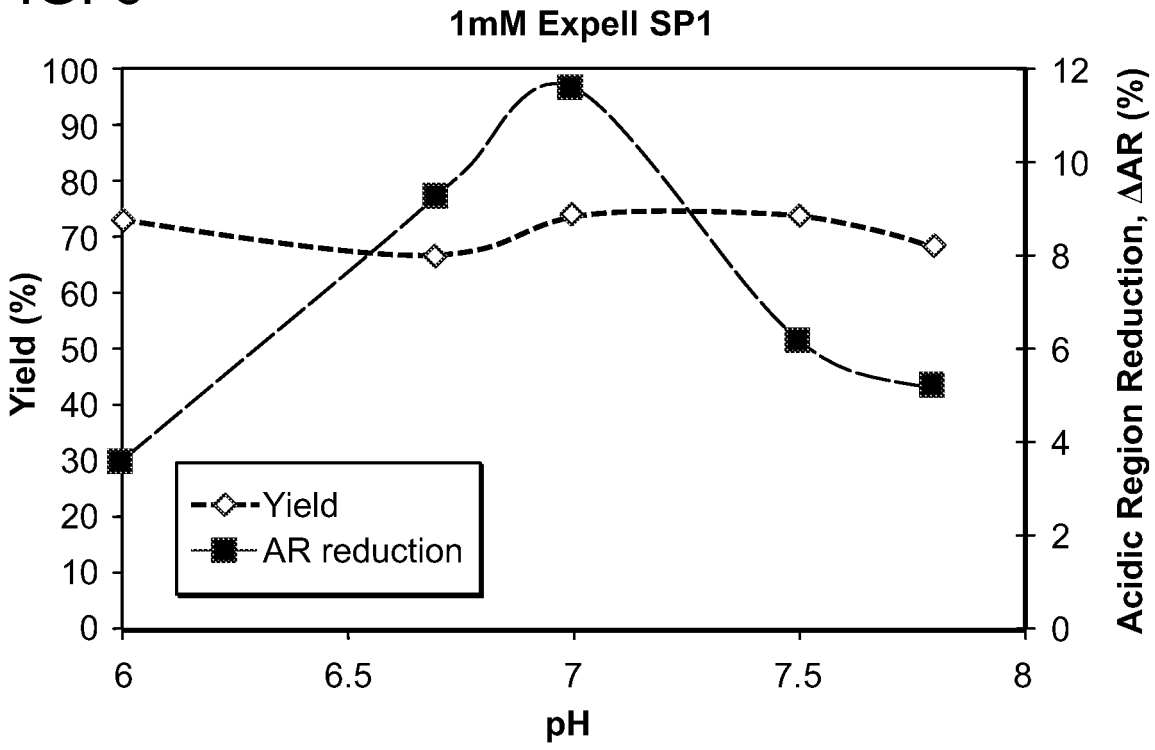

1mM Expell SP1
Yield (%)
Acidic Region Reduction, ΔAR (%)
pH
Yield
AR reduction
0
10
20
30
40
50
60
70
80
90
100
0
2
4
6
8
10
12
6
6.5
7
7.5
8

FIG. 7

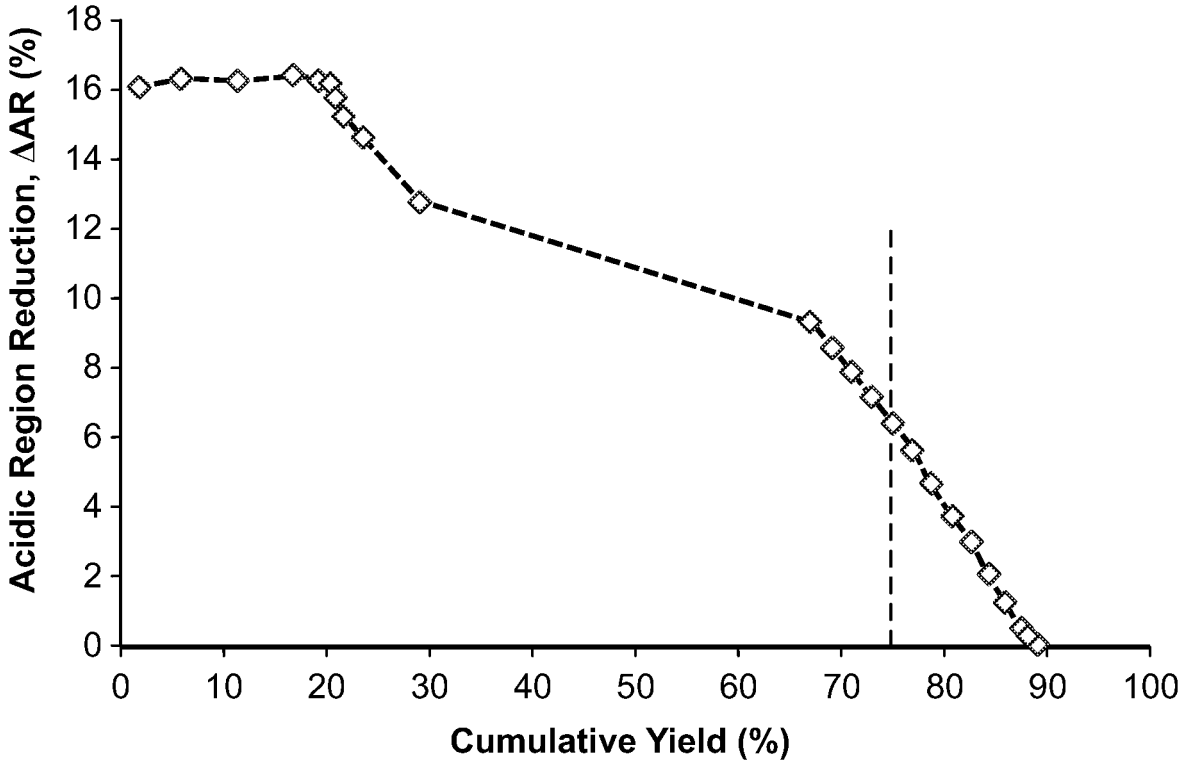

Acidic Region Reduction, ΔAR (%)
18
16
14
12
10
8
6
4
2
0
0
10
20
30
40
50
60
70
80
90
100
Cumulative Yield (%)

FIG. 8

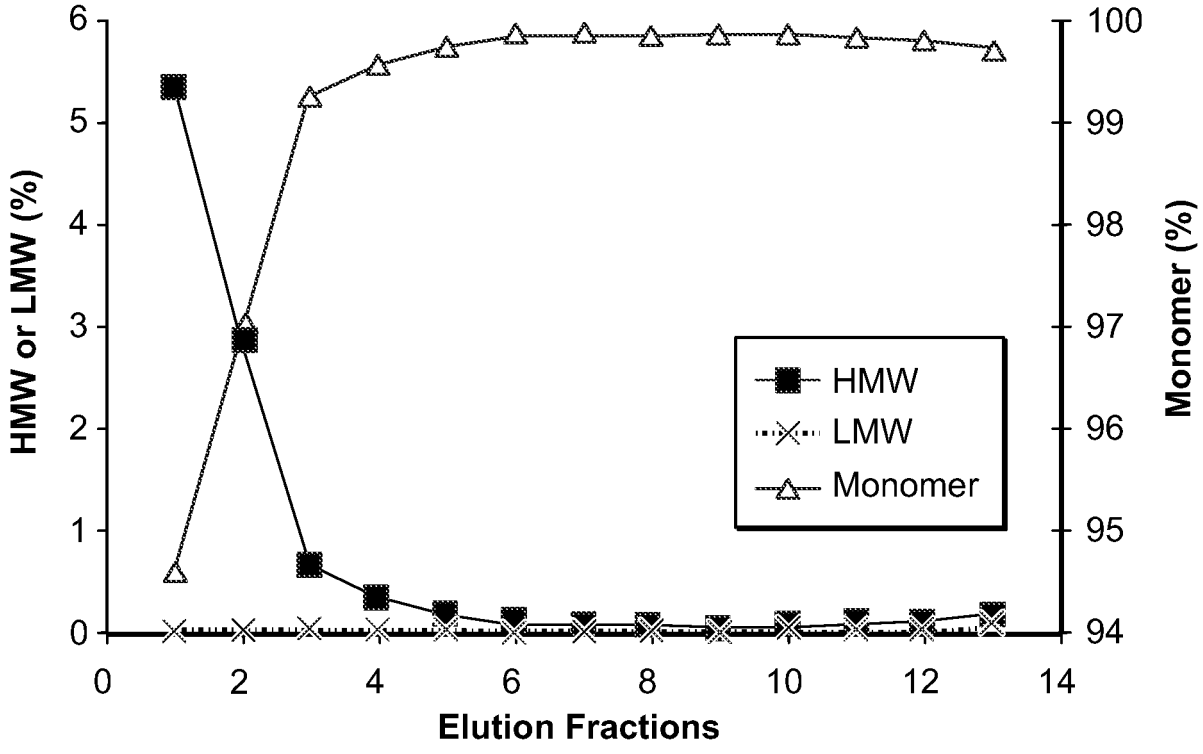

HMW or LMW (%)
6
5
4
3
2
1
0
100
99
98
97
96
95
94
Monomer (%)
0
2
4
6
8
10
12
14
Elution Fractions
HMW
LMW
Monomer

FIG. 9

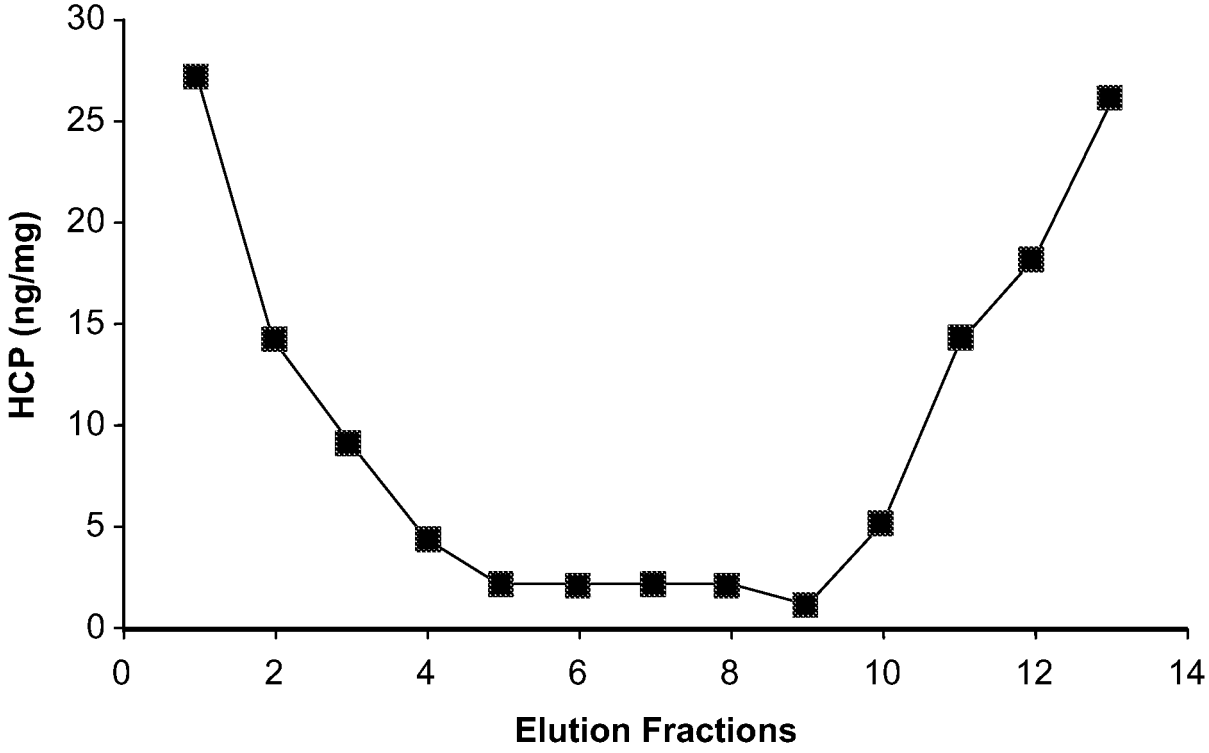

HCP (ng/mg)
30
25
20
15
10
5
0
0
2
4
6
8
10
12
14
Elution Fractions

FIG. 10

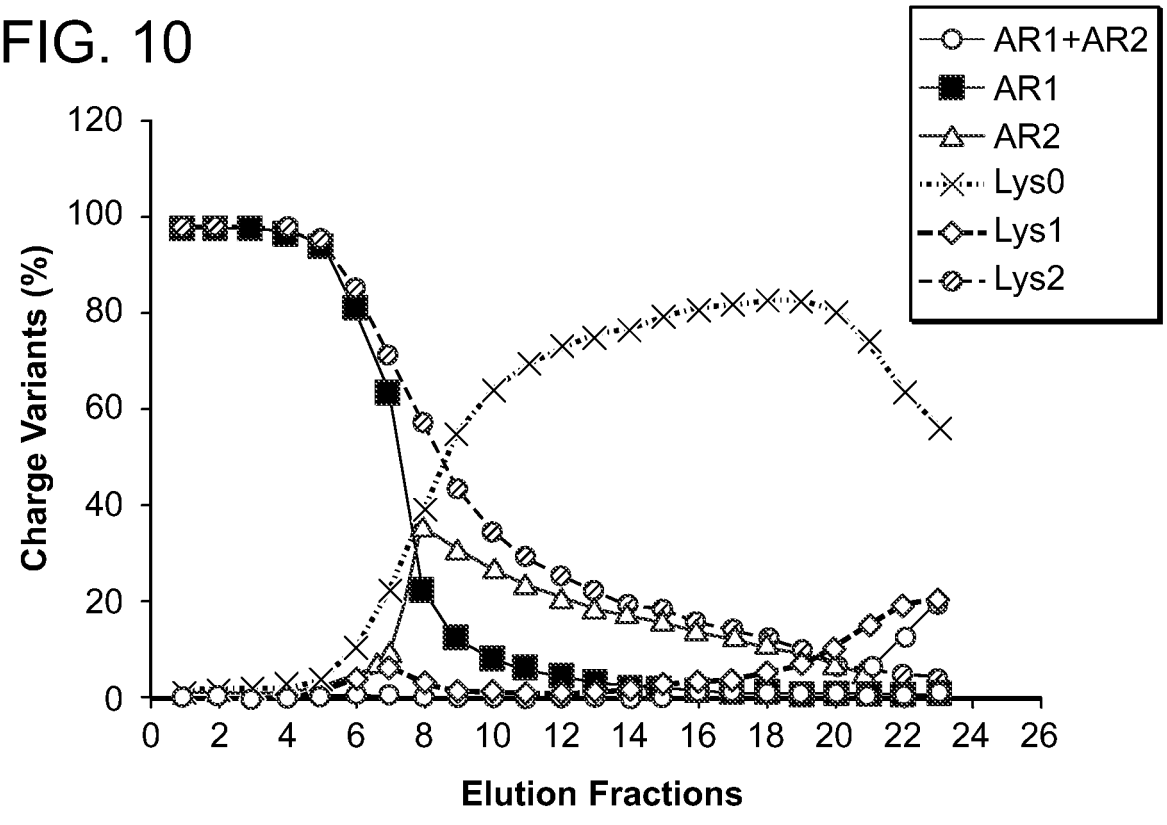

AR1+AR2
AR1
AR2
Lys0
Lys1
Lys2
Charge Variants (%)
120
100
80
60
40
20
0
0
2
4
6
8
10
12
14
16
18
20
22
24
26
Elution Fractions

FIG. 11

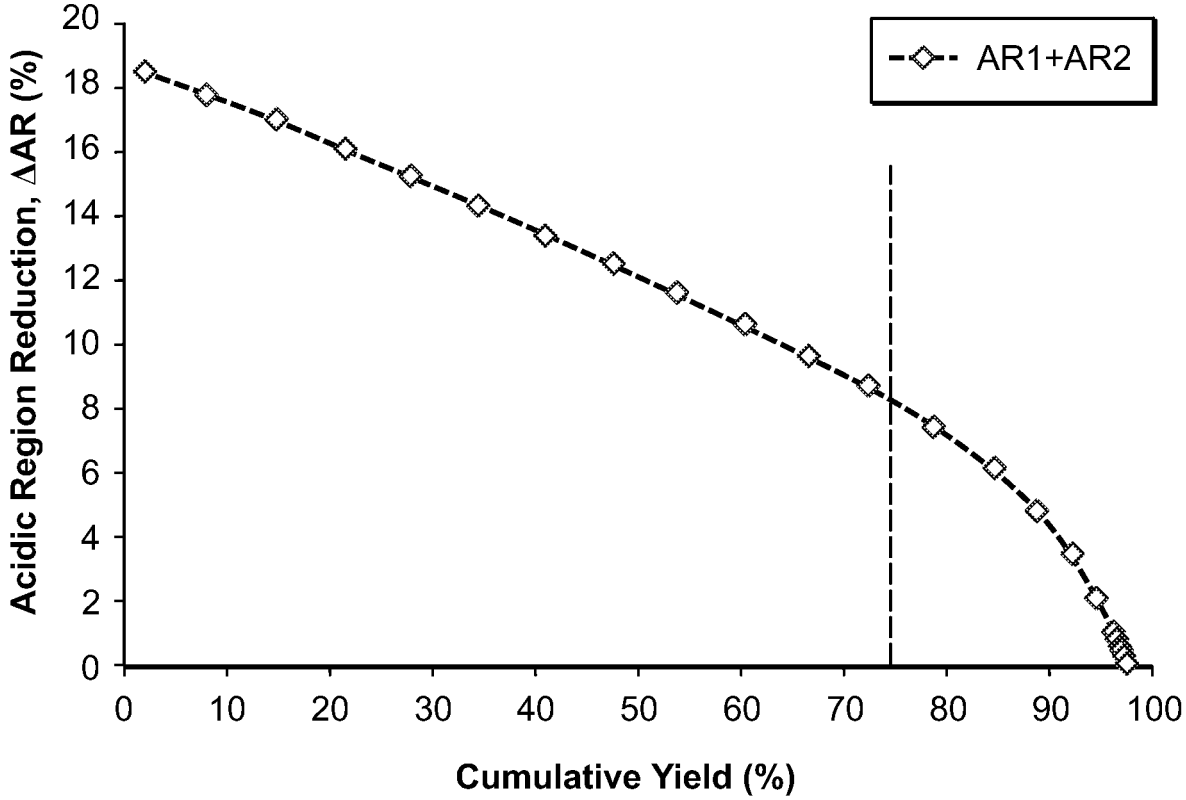

AR1+AR2
Acidic Region Reduction, ΔAR (%)
Cumulative Yield (%)
0
2
4
6
8
10
12
14
16
18
20
0
10
20
30
40
50
60
70
80
90
100

FIG. 12

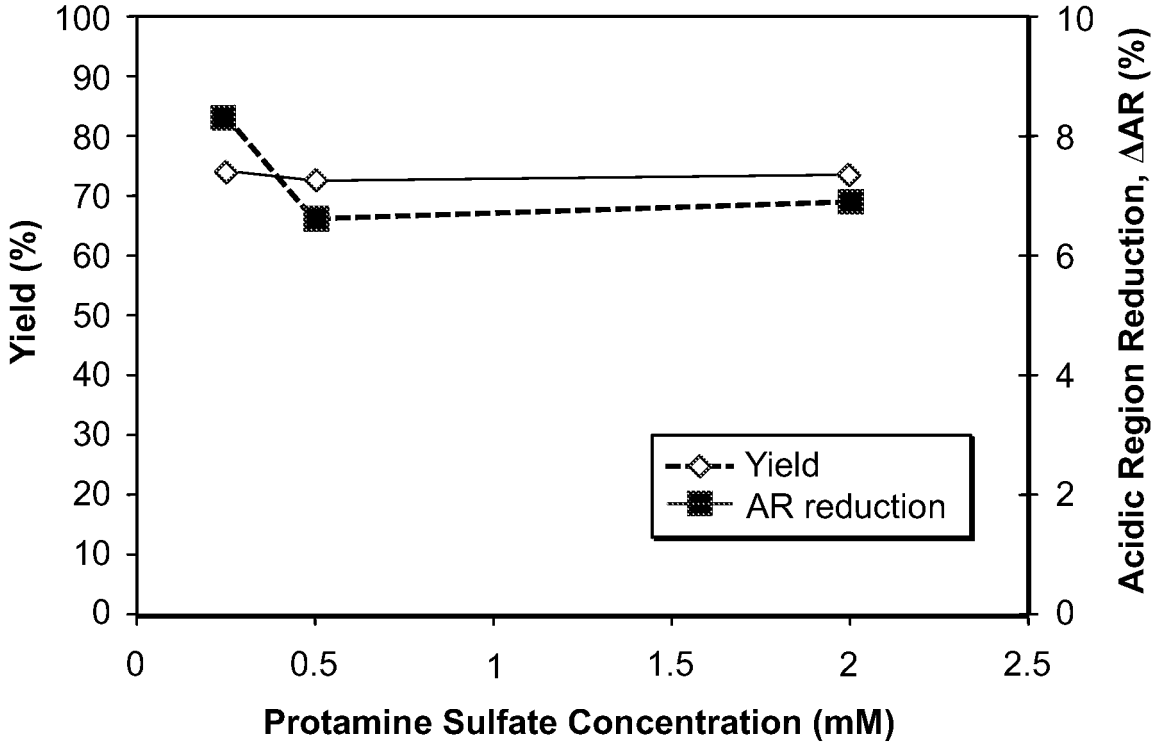

Yield
AR reduction
Yield (%)
Acidic Region Reduction, ΔAR (%)
Protamine Sulfate Concentration (mM)
0
10
20
30
40
50
60
70
80
90
100
0
2
4
6
8
10
0
0.5
1
1.5
2
2.5

FIG. 13

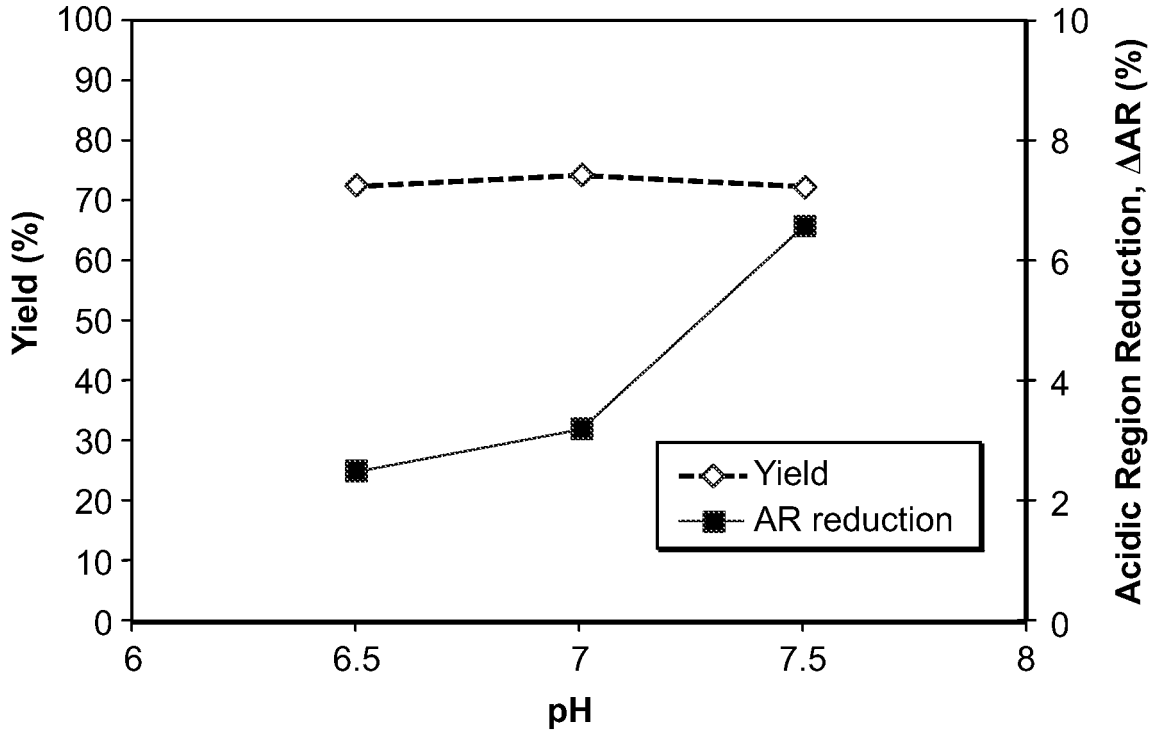

Yield (%)
Acidic Region Reduction, ΔAR (%)
pH
Yield
AR reduction
100
90
80
70
60
50
40
30
20
10
0
10
8
6
4
2
0
6
6.5
7
7.5
8

FIG. 14

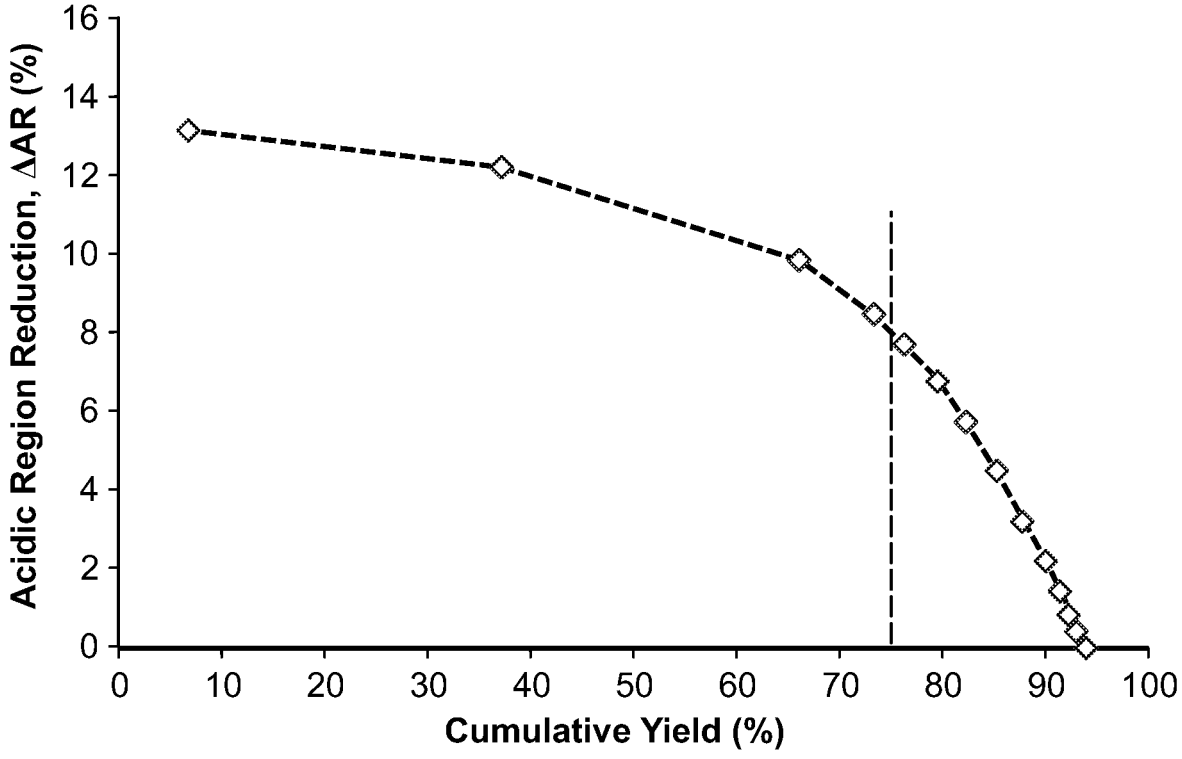

Acidic Region Reduction, ΔAR (%)
Cumulative Yield (%)
16
14
12
10
8
6
4
2
0
0
10
20
30
40
50
60
70
80
90
100

FIG. 15

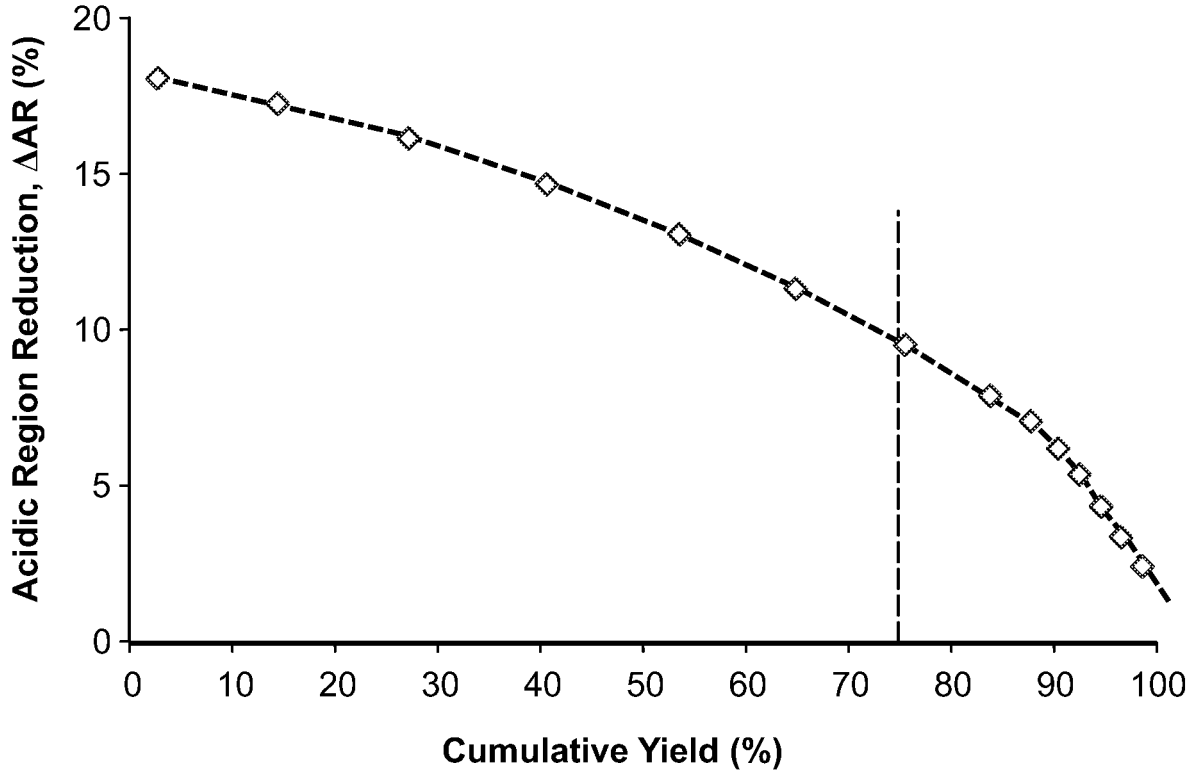

Acidic Region Reduction, ΔAR (%)
20
15
10
5
0
0
10
20
30
40
50
60
70
80
90
100
Cumulative Yield (%)

FIG. 16

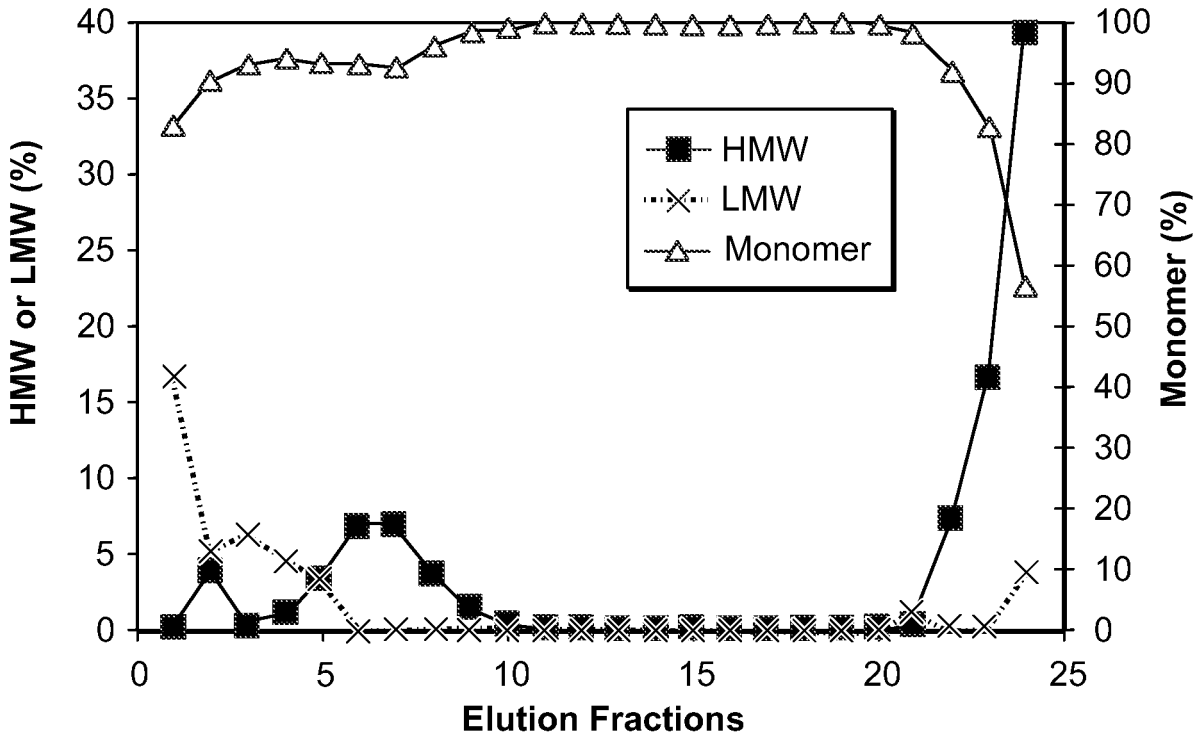

HMW or LMW (%)
40
35
30
25
20
15
10
5
0
100
90
80
70
60
50
40
30
20
10
0
Monomer (%)
HMW
LMW
Monomer
0
5
10
15
20
25
Elution Fractions

FIG. 17

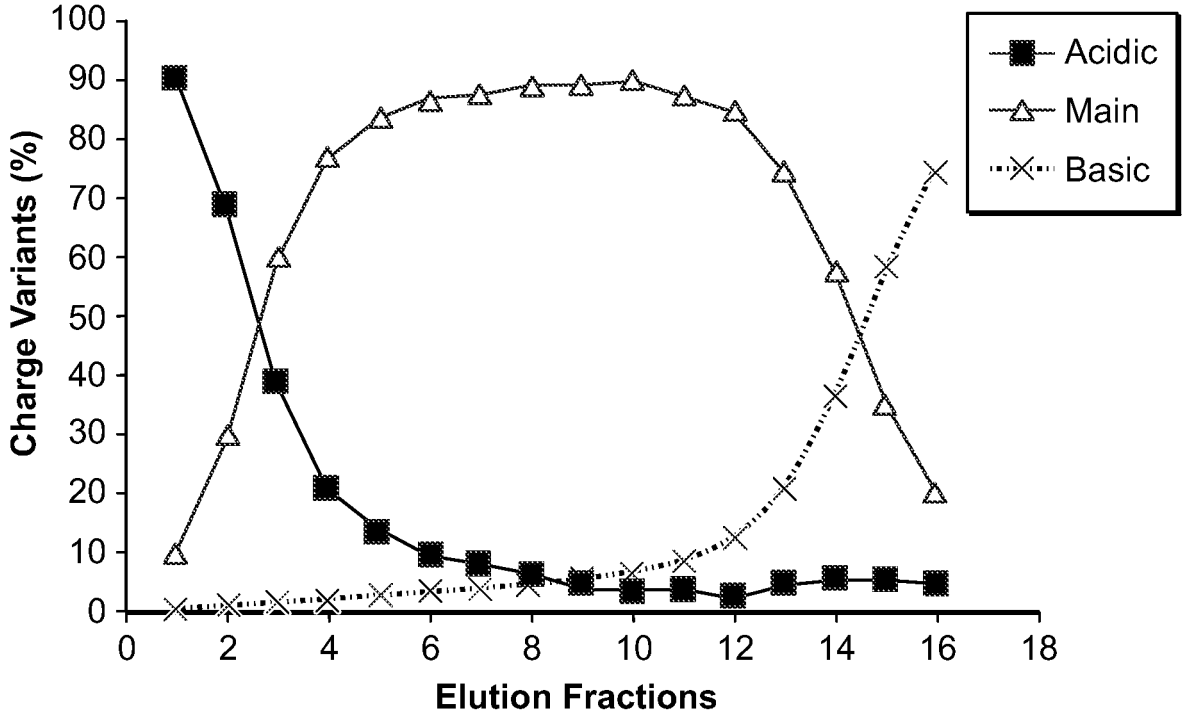

Charge Variants (%)
Elution Fractions
Acidic
Main
Basic
0
10
20
30
40
50
60
70
80
90
100
0
2
4
6
8
10
12
14
16
18

FIG. 18

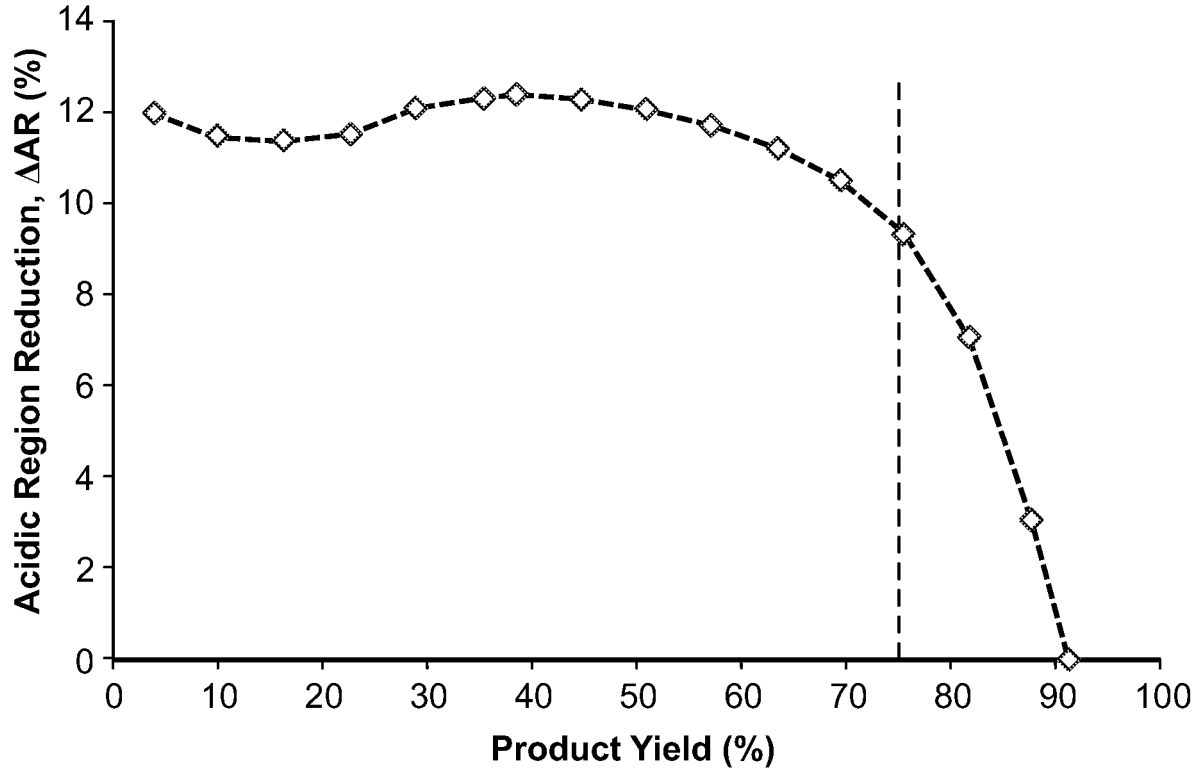

Acidic Region Reduction, ΔAR (%)
Product Yield (%)
0
2
4
6
8
10
12
14
0
10
20
30
40
50
60
70
80
90
100

FIG. 19

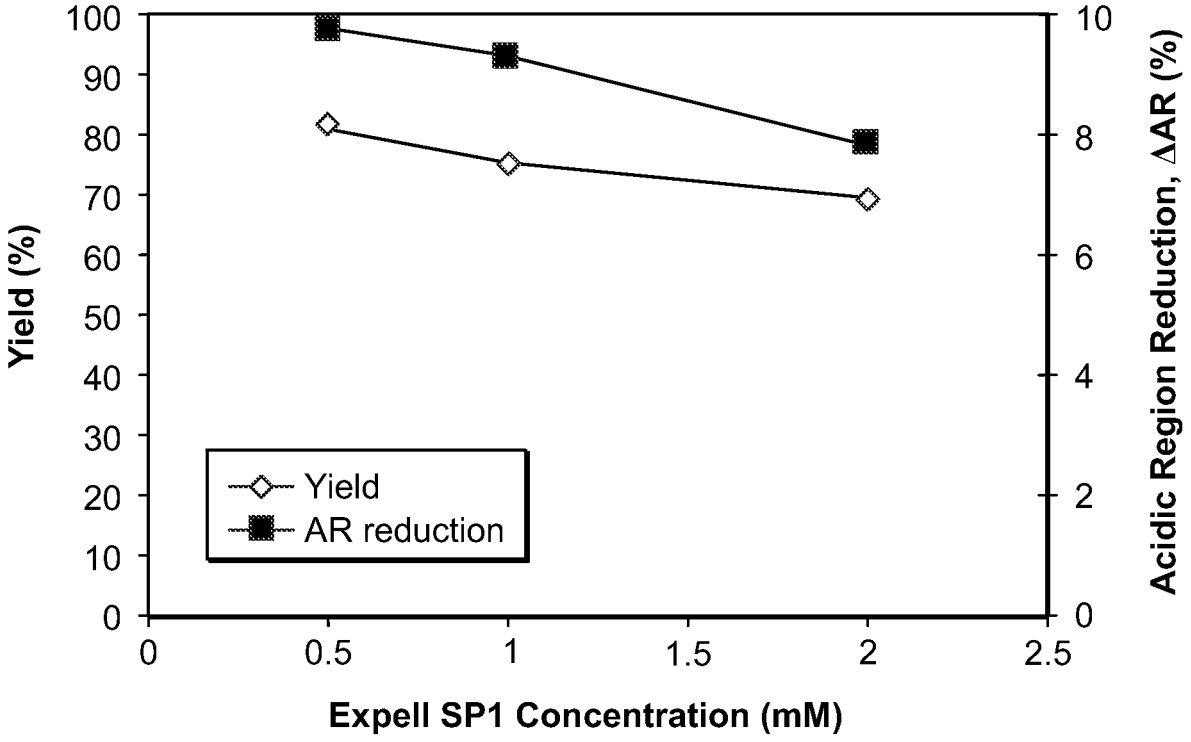

Yield (%)
Acidic Region Reduction, ΔAR (%)
Expell SP1 Concentration (mM)
Yield
AR reduction
0
10
20
30
40
50
60
70
80
90
100
0
2
4
6
8
10
0
0.5
1
1.5
2
2.5

FIG. 20

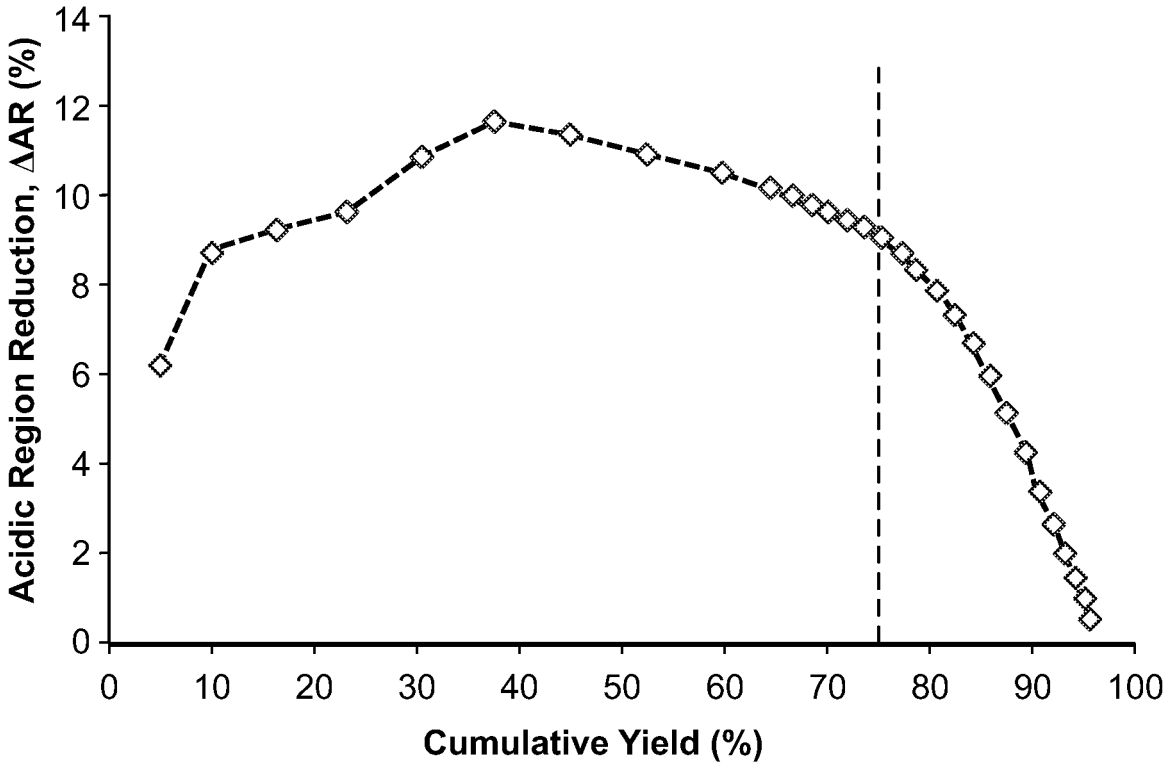

Acidic Region Reduction, ΔAR (%)
Cumulative Yield (%)
0
2
4
6
8
10
12
14
0
10
20
30
40
50
60
70
80
90
100

FIG. 21

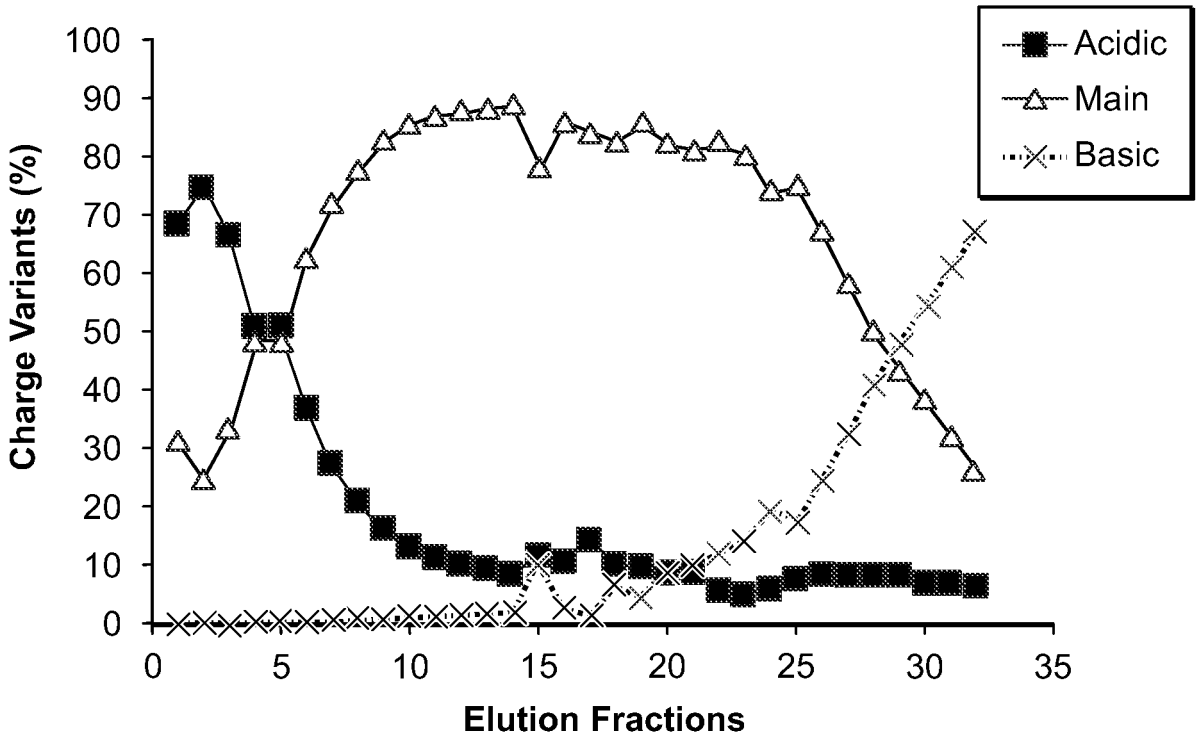

Acidic
Main
Basic
Charge Variants (%)
100
90
80
70
60
50
40
30
20
10
0
0
5
10
15
20
25
30
35
Elution Fractions

FIG. 22

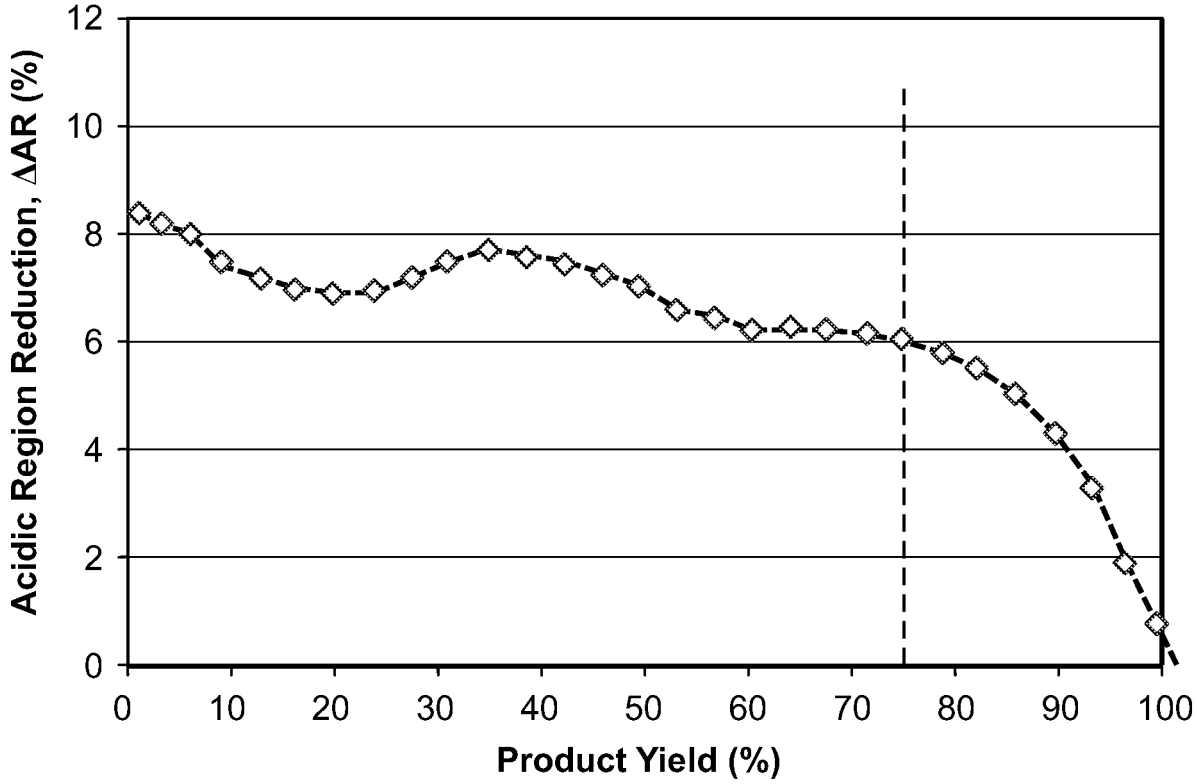

Acidic Region Reduction, ΔAR (%)
12
10
8
6
4
2
0
0
10
20
30
40
50
60
70
80
90
100
Product Yield (%)

FIG. 23

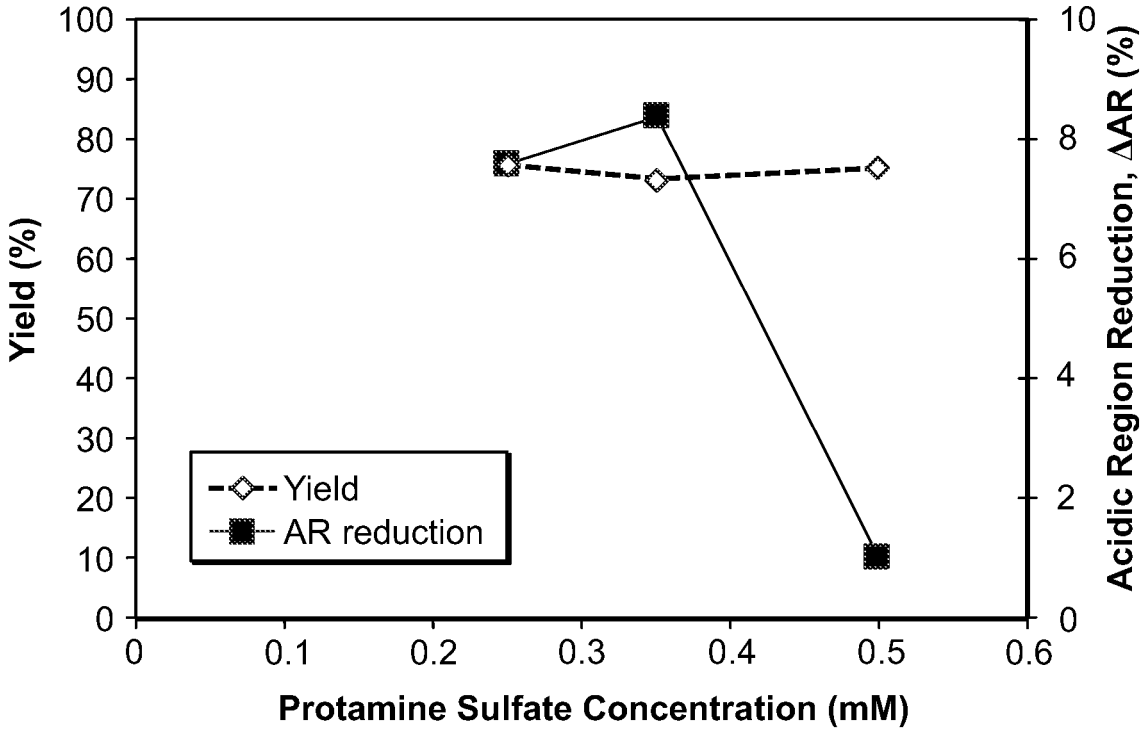

Yield (%)
Acidic Region Reduction, ΔAR (%)
Protamine Sulfate Concentration (mM)
Yield
AR reduction
0
10
20
30
40
50
60
70
80
90
100
0
2
4
6
8
10
0
0.1
0.2
0.3
0.4
0.5
0.6

FIG. 24

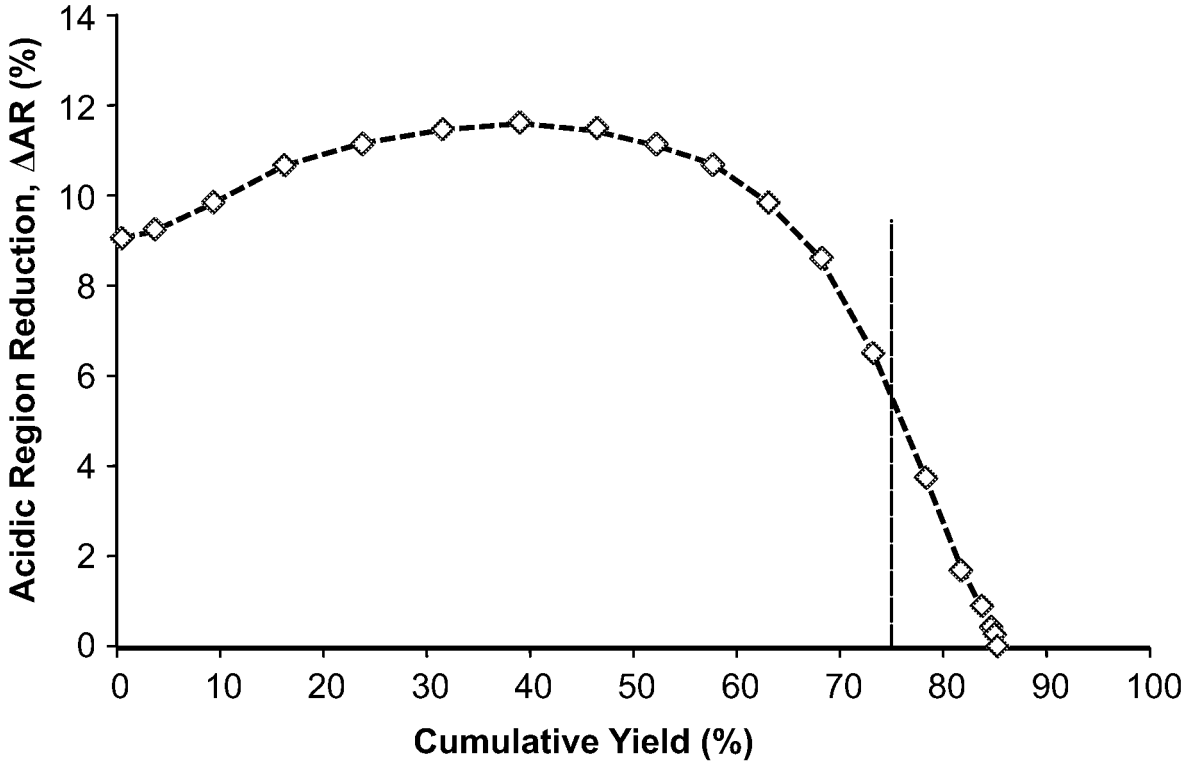

Acidic Region Reduction, ΔAR (%)
Cumulative Yield (%)
0
2
4
6
8
10
12
14
0
10
20
30
40
50
60
70
80
90
100

FIG. 25

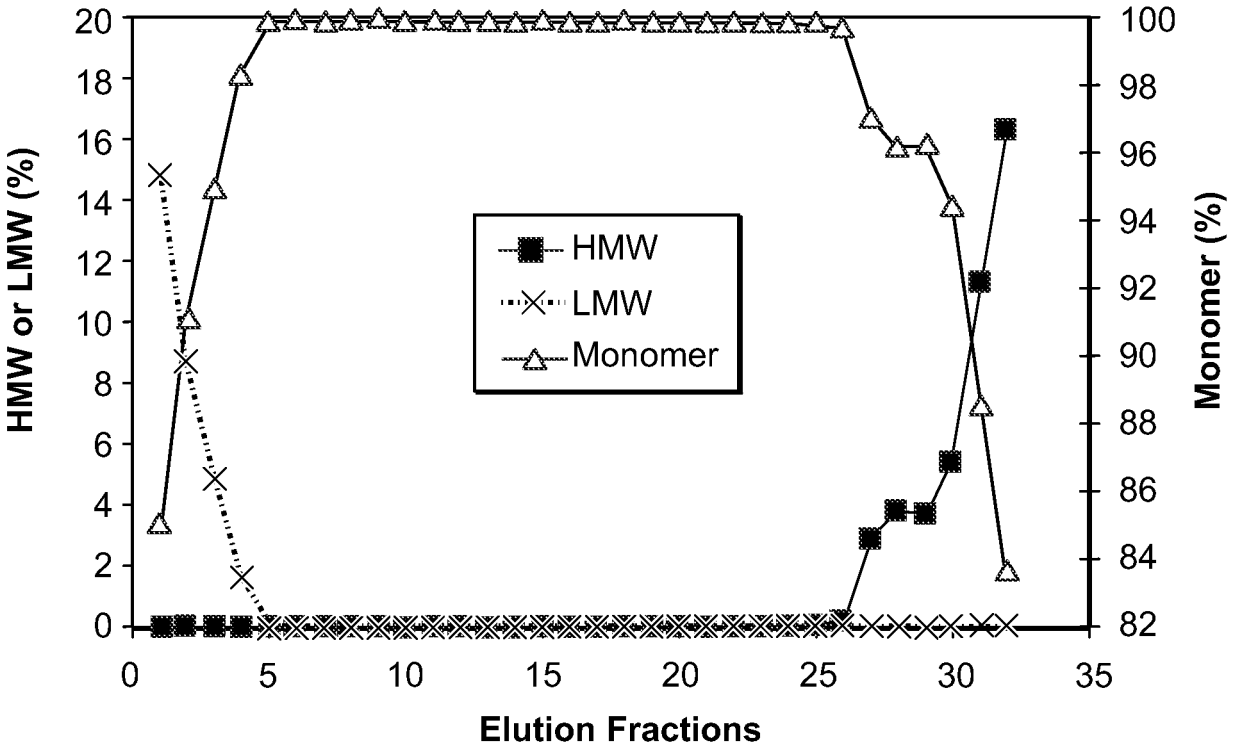

HMW or LMW (%)
Monomer (%)
HMW
LMW
Monomer
Elution Fractions

FIG. 26

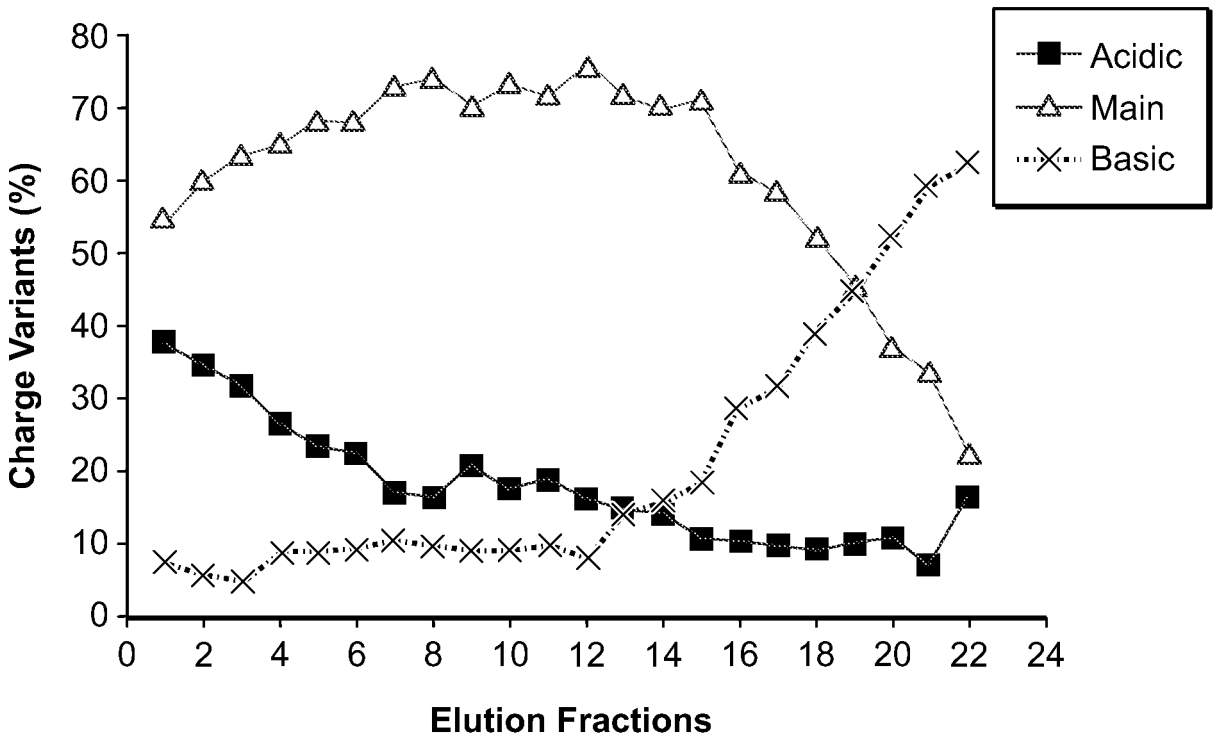

Charge Variants (%)
Acidic
Main
Basic
Elution Fractions

FIG. 27

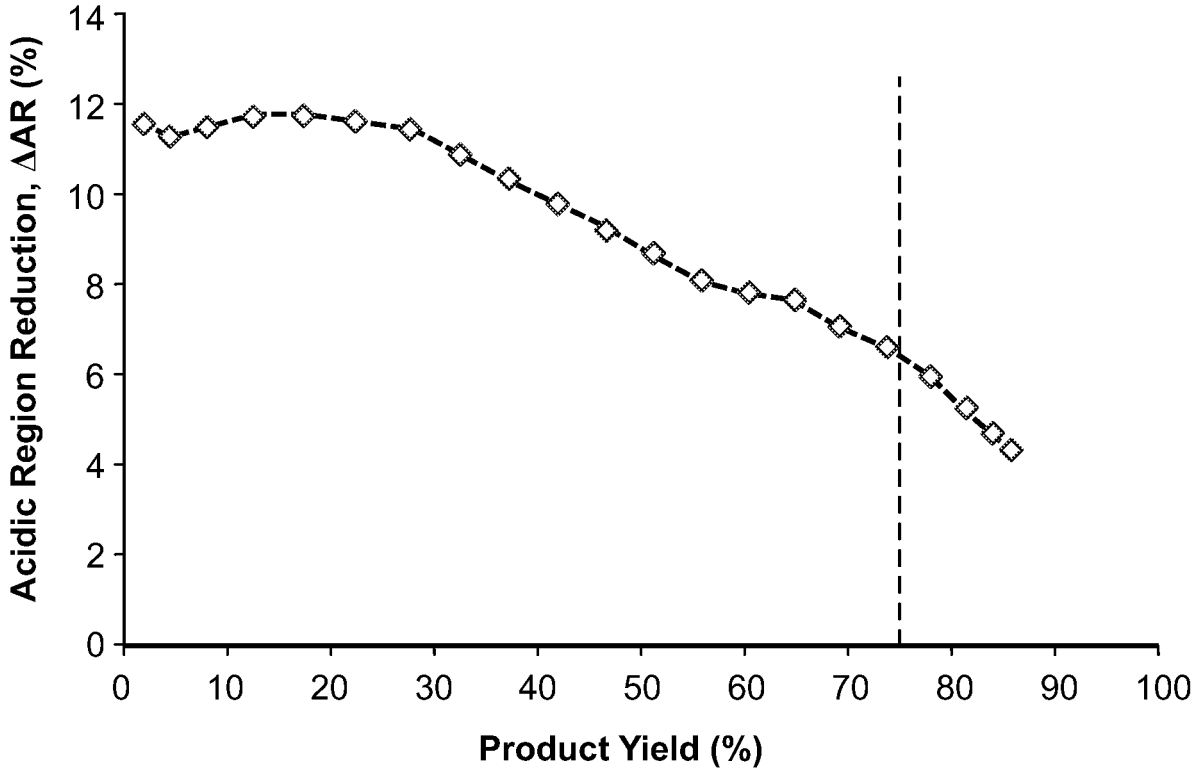

Acidic Region Reduction, ΔAR (%)
14
12
10
8
6
4
2
0
0
10
20
30
40
50
60
70
80
90
100
Product Yield (%)

FIG. 28

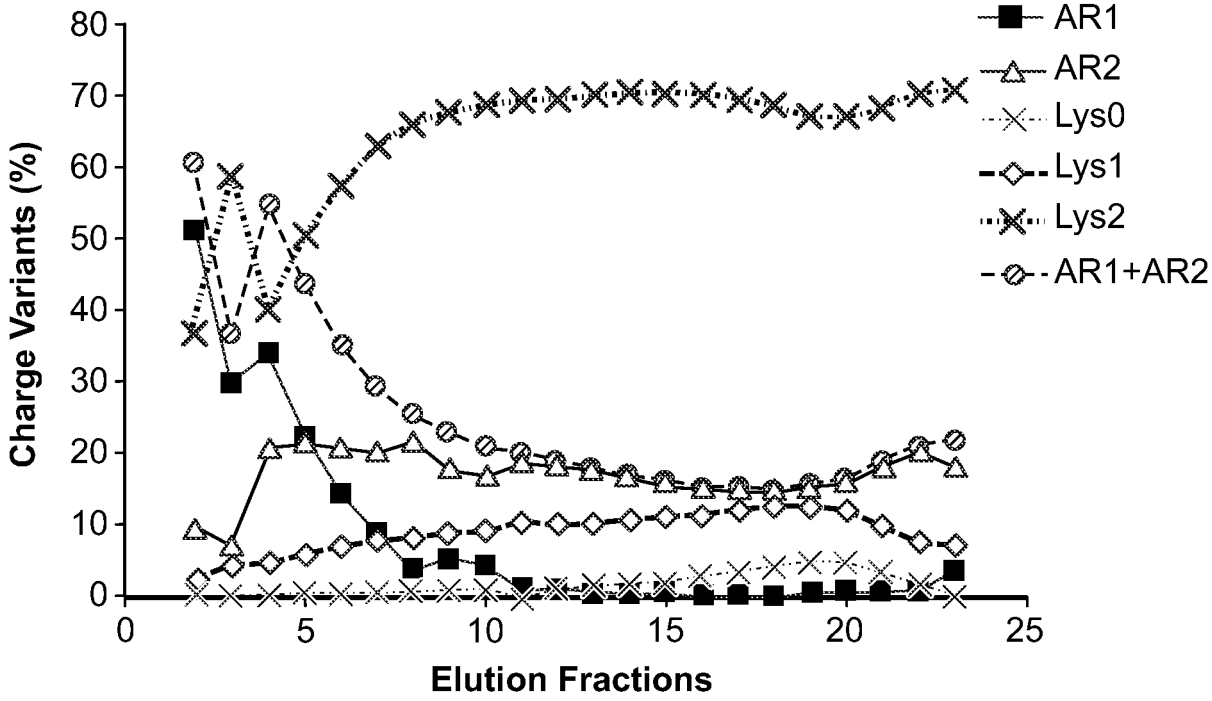

Charge Variants (%)
80
70
60
50
40
30
20
10
0
0
5
10
15
20
25
Elution Fractions
AR1
AR2
Lys0
Lys1
Lys2
AR1+AR2

FIG. 29

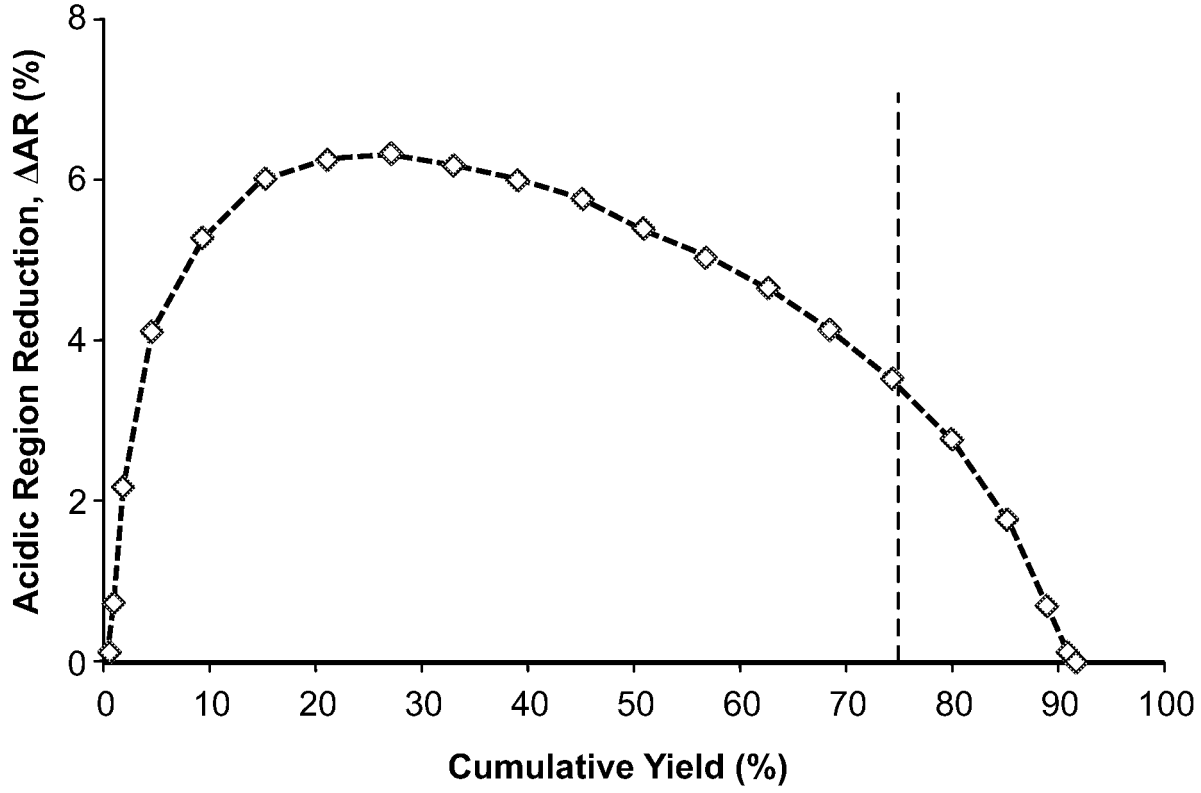

Acidic Region Reduction, ΔAR (%)
8
6
4
2
0
0
10
20
30
40
50
60
70
80
90
100
Cumulative Yield (%)

FIG. 30

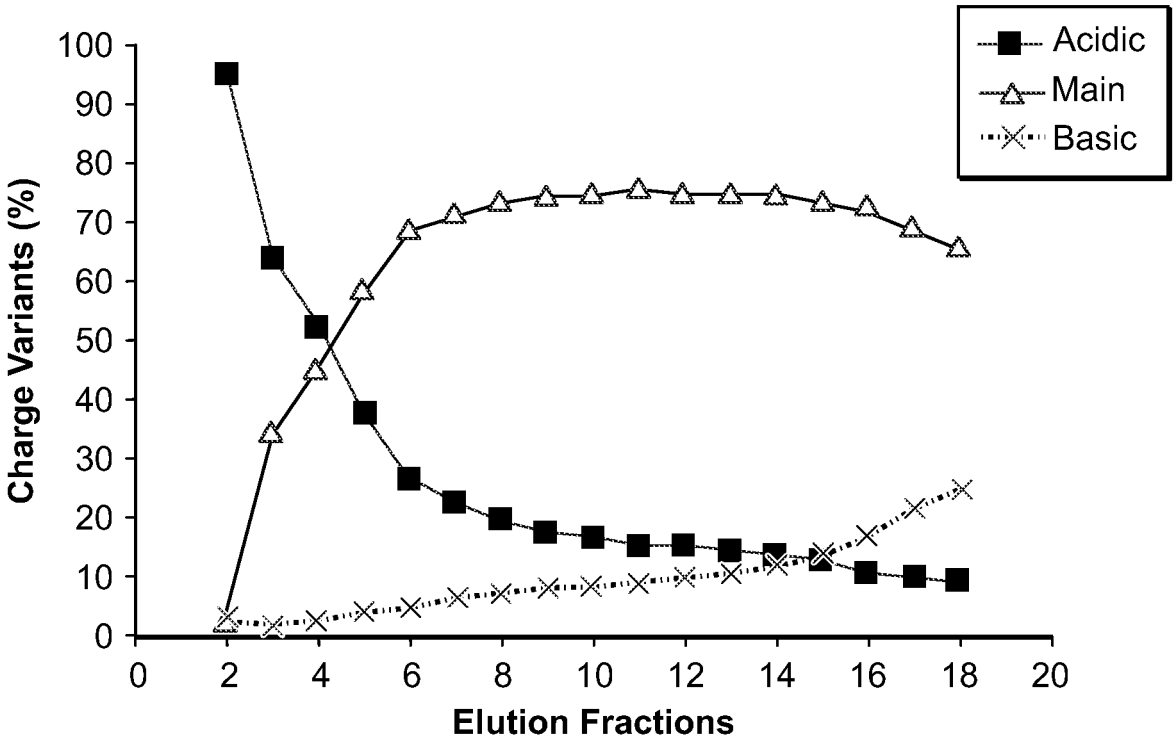

Acidic
Main
Basic
Charge Variants (%)
100
90
80
70
60
50
40
30
20
10
0
0
2
4
6
8
10
12
14
16
18
20
Elution Fractions

FIG. 31

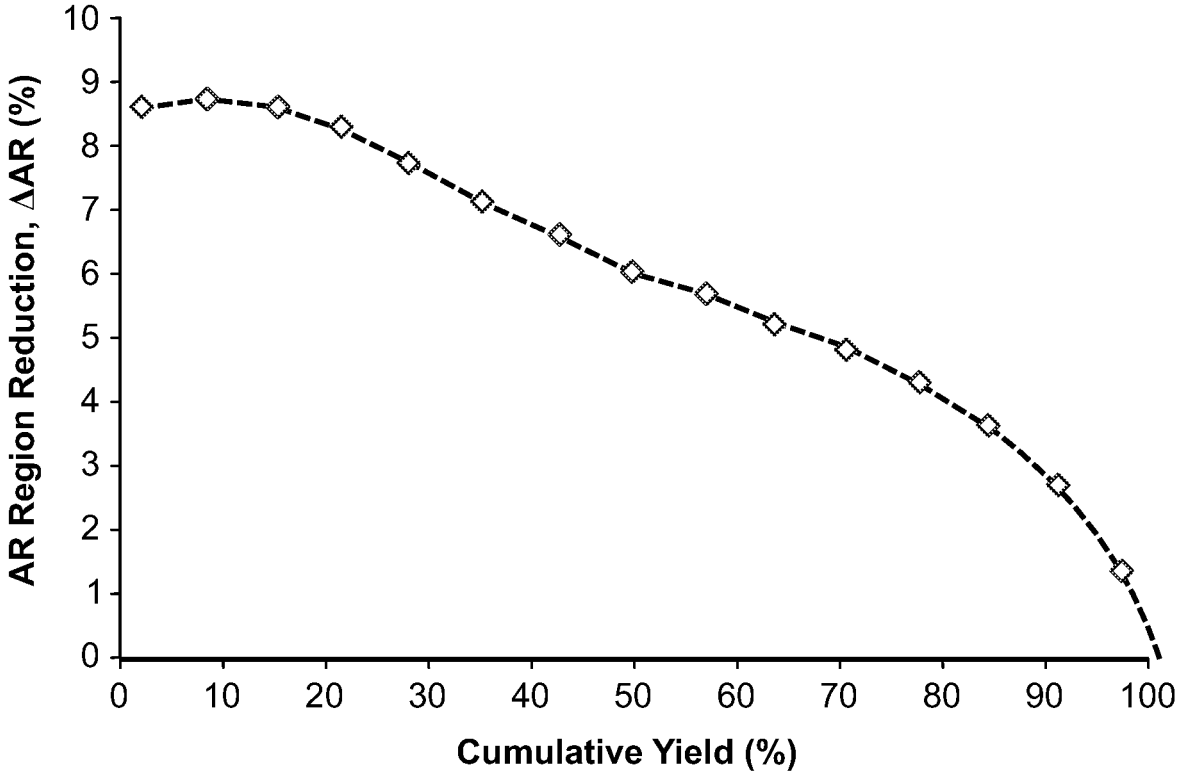

AR Region Reduction, ΔAR (%)
Cumulative Yield (%)
0
1
2
3
4
5
6
7
8
9
10
0
10
20
30
40
50
60
70
80
90
100

FIG. 32

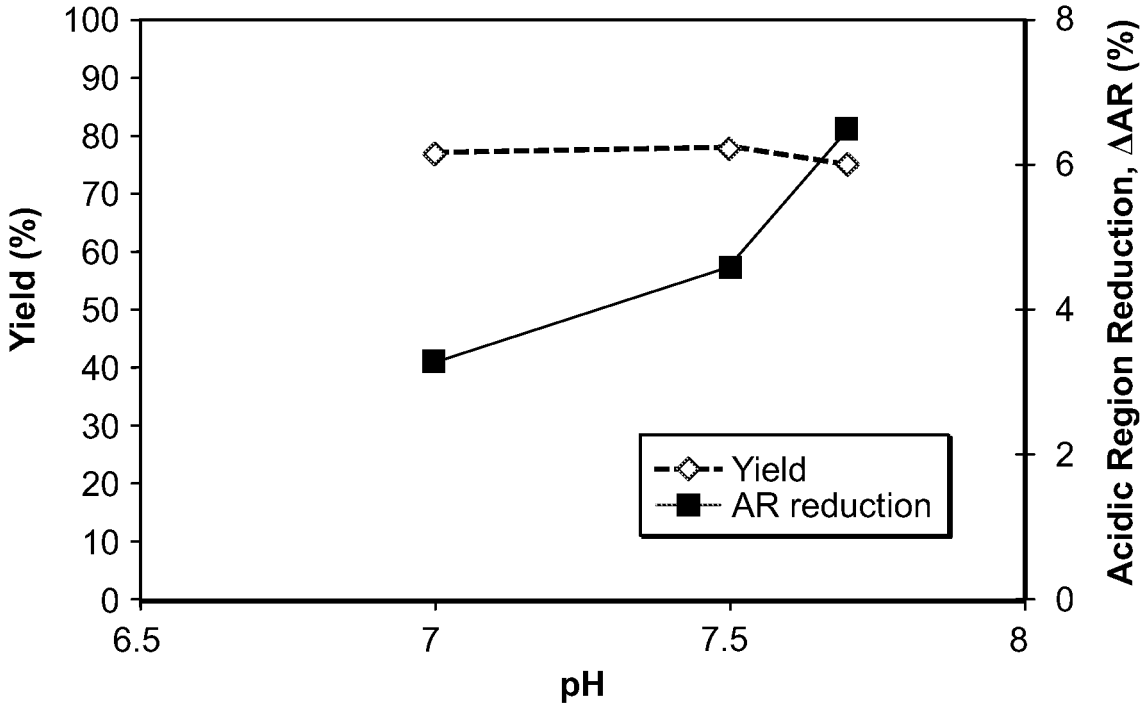
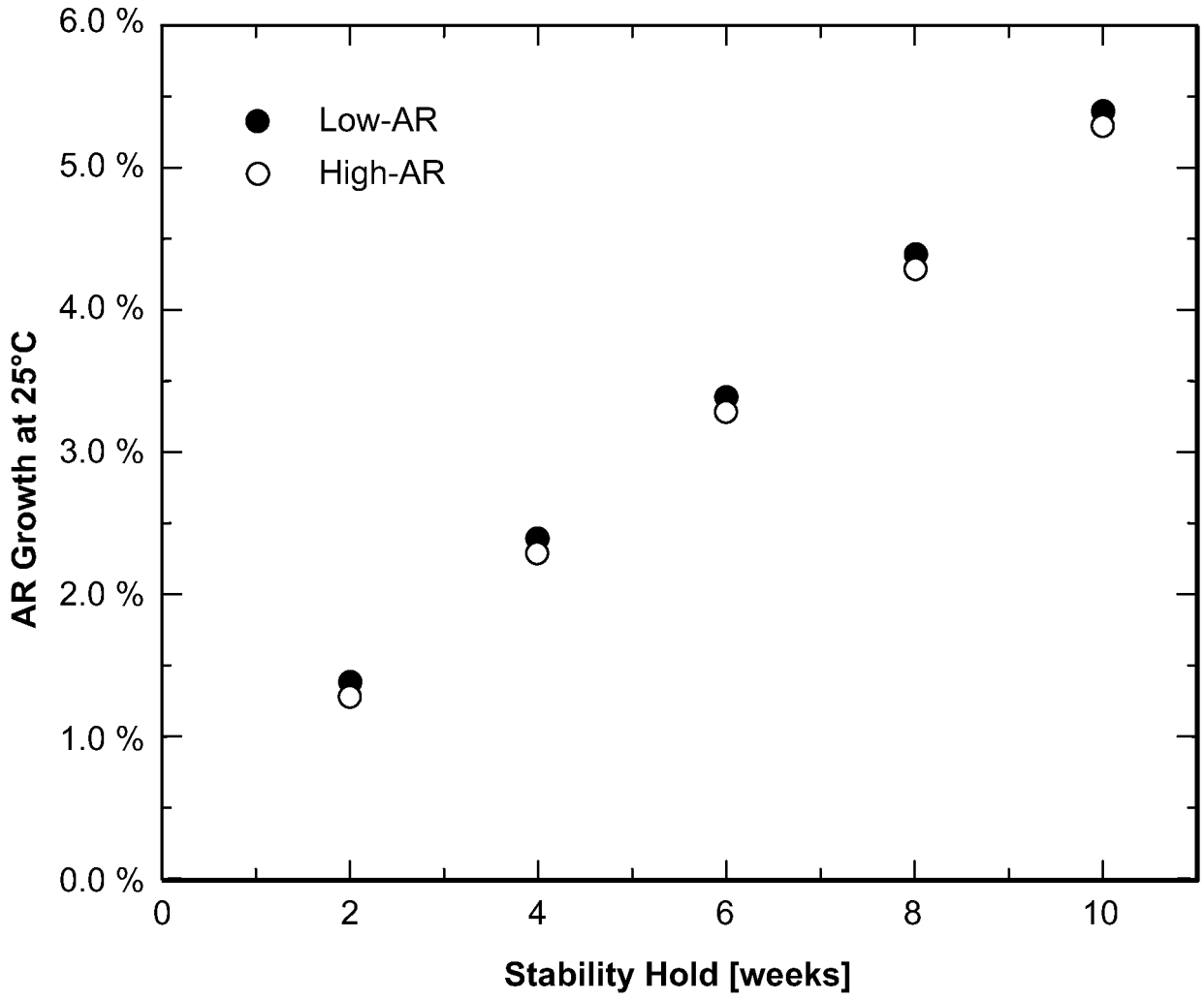

Yield (%)
Acidic Region Reduction, ΔAR (%)
pH
Yield
AR reduction
0
10
20
30
40
50
60
70
80
90
100
0
2
4
6
8
6.5
7
7.5
8

FIG. 33


6.0 %
5.0 %
4.0 %
3.0 %
2.0 %
1.0 %
0.0 %
AR Growth at 25°C
Low-AR
High-AR
0
2
4
6
8
10
Stability Hold [weeks]