FIGURE 1

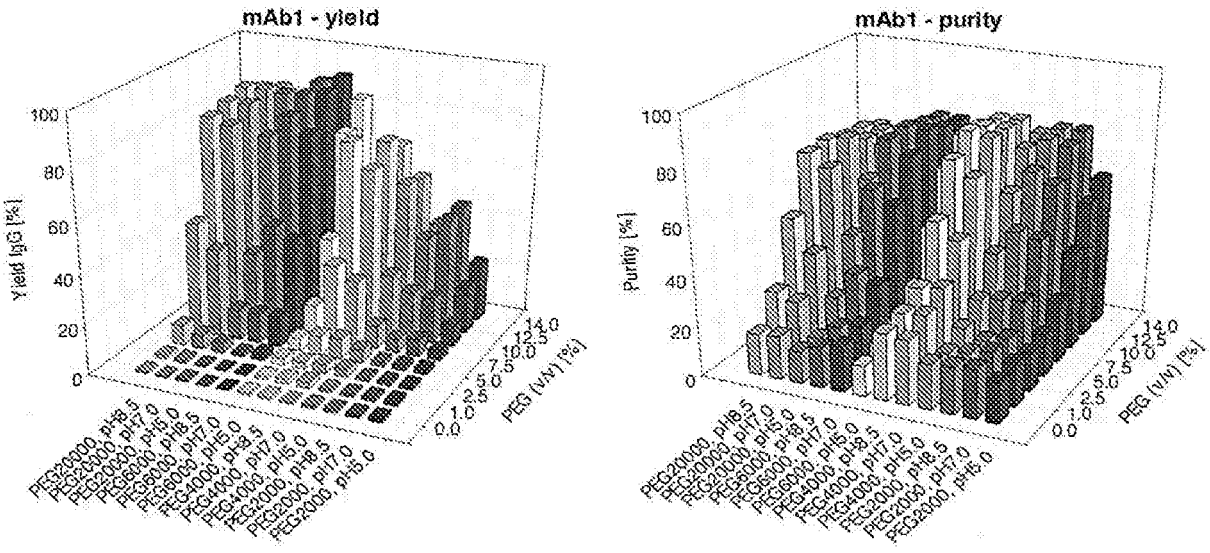


FIGURE 2

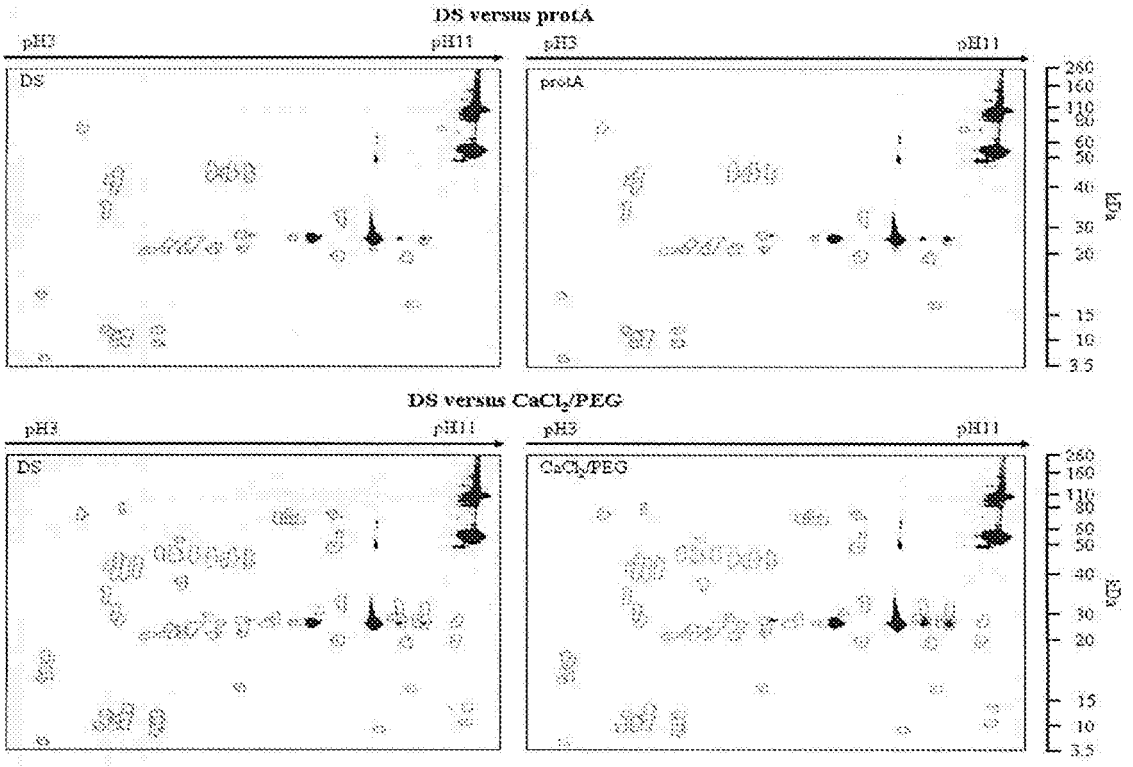
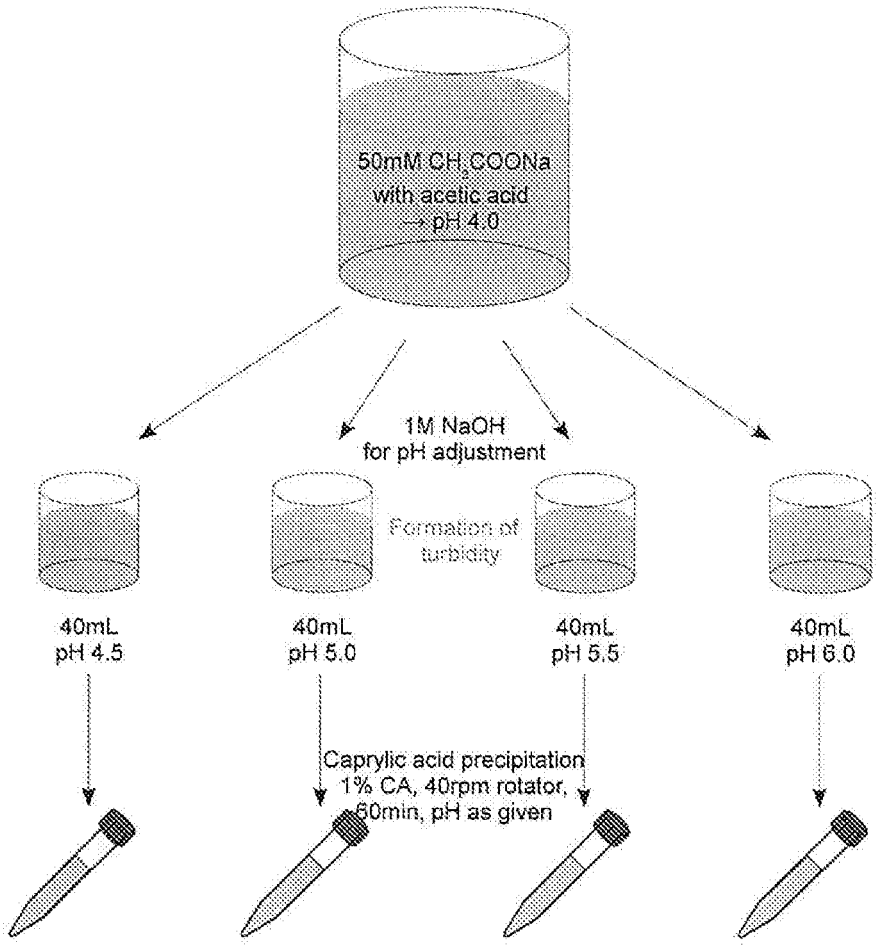


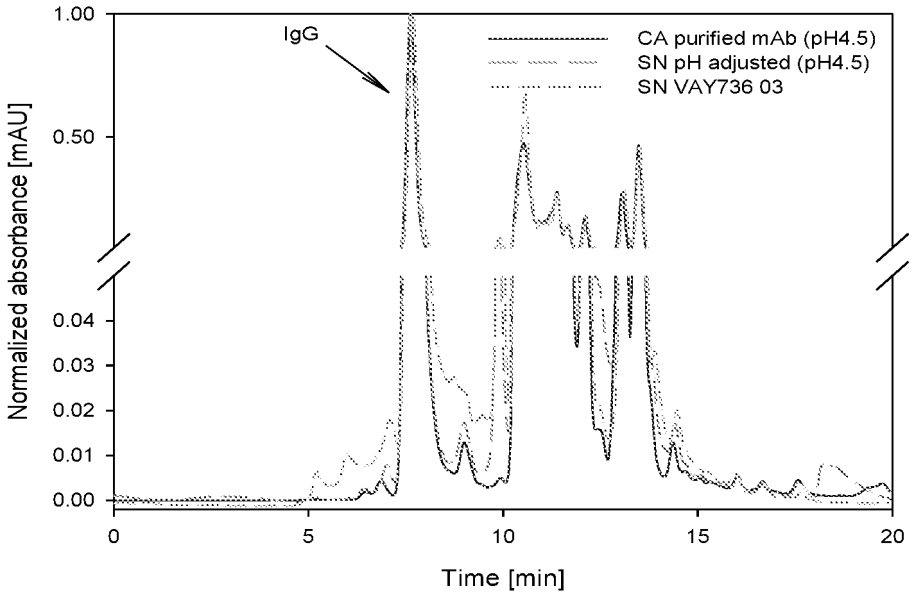
FIGURE 3



3 Different process steps:
(1) Precipitation: RT → Centrifugation: RT + Filtration: RT → Storage: RT
(2) Precipitation: RT → Centrifugation: RT + Filtration: RT → Storage: 4°C
(3) Precipitation: RT → Centrifugation: 4°C + Filtration: 4°C → Storage: 4°C

FIGURE 4

A. B03



B. B07

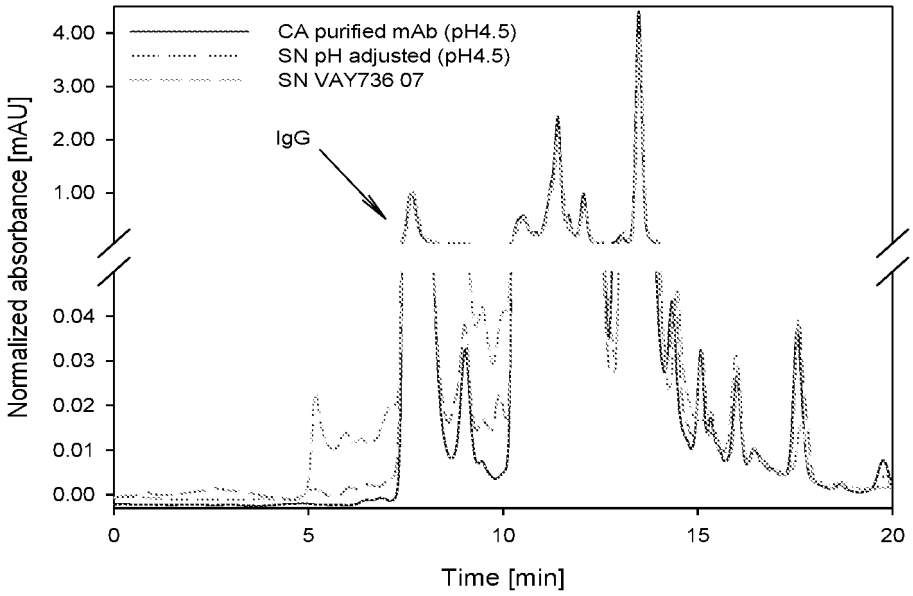
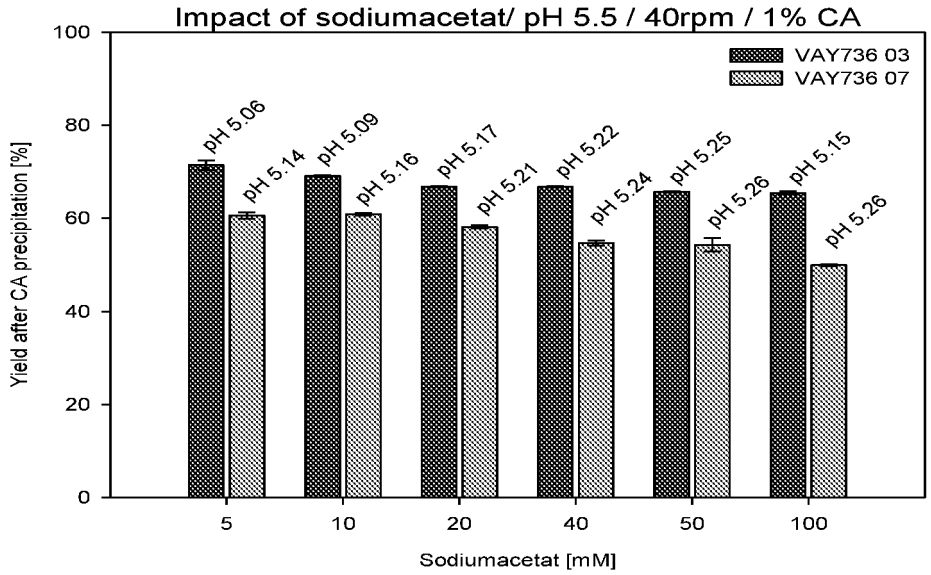


FIGURE 5

A. B03



B. B07

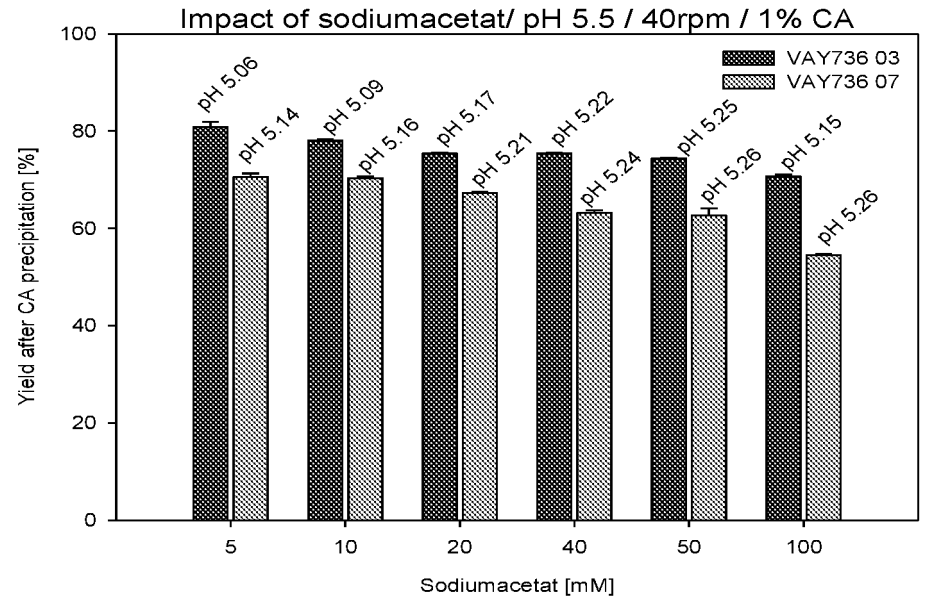
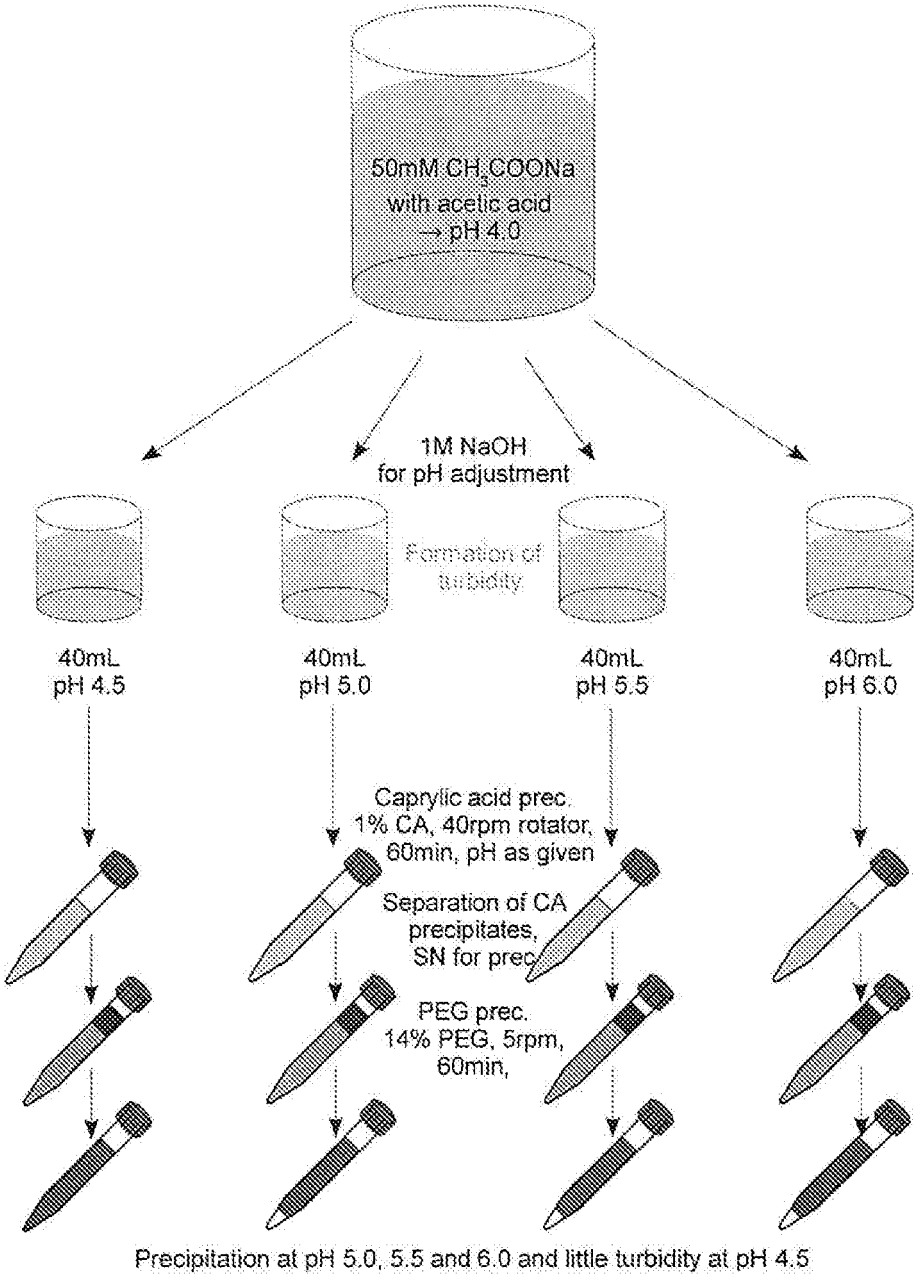


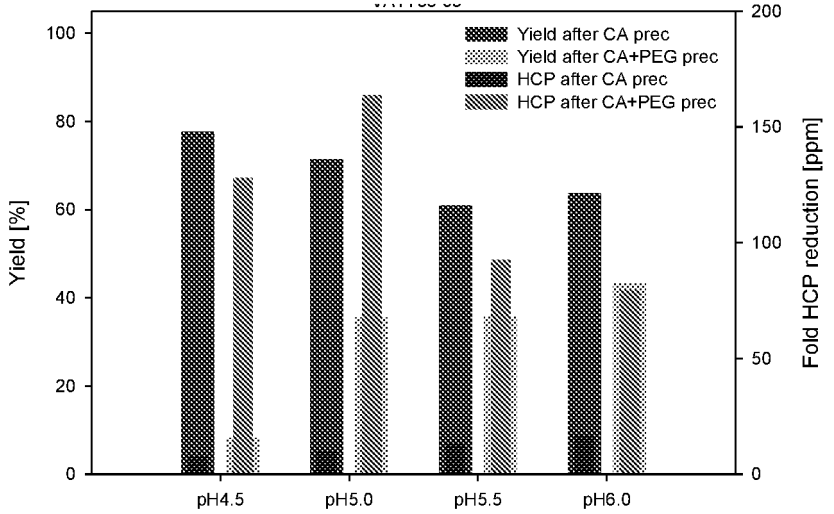
FIGURE 6



Precipitation at pH 5.0, 5.5 and 6.0 and little turbidity at pH 4.5

Figure 7

A. B03



B. B07

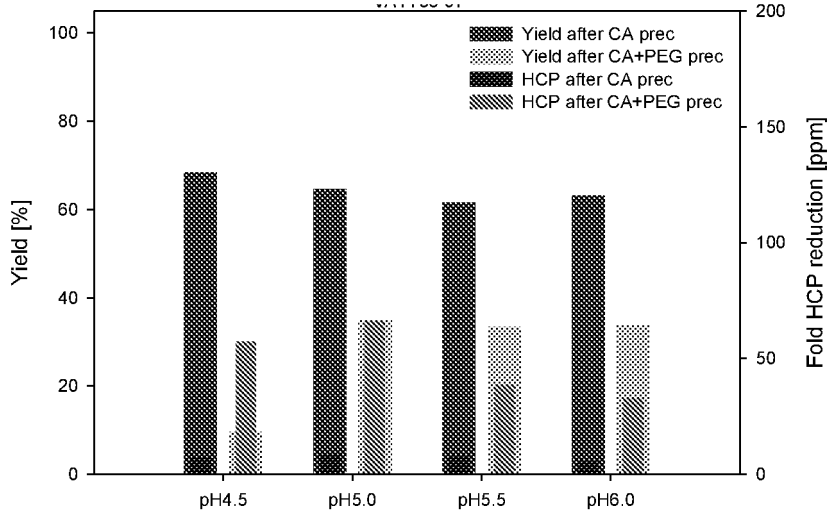
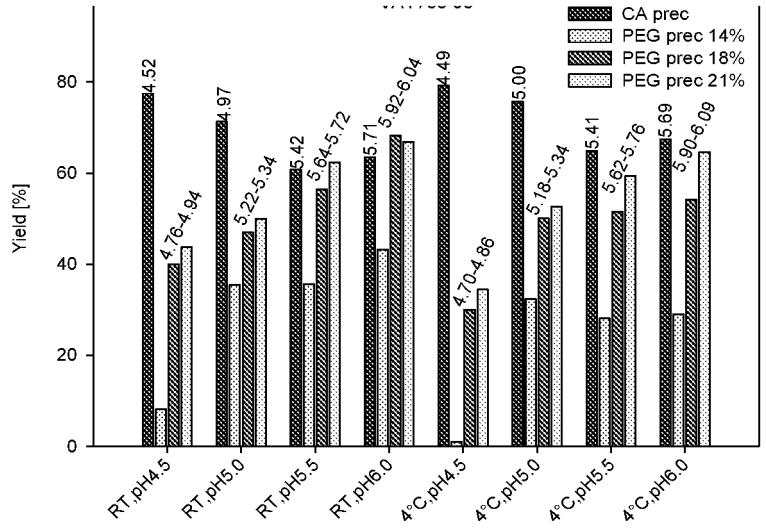


FIGURE 8

A. B03



B. B07

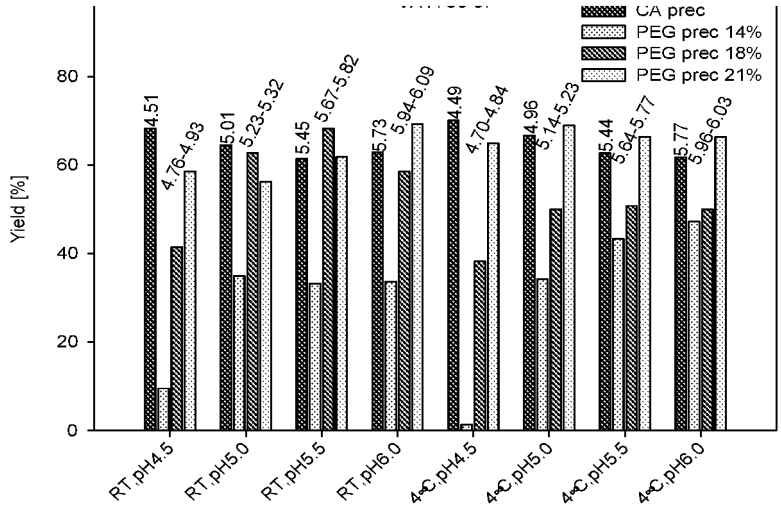
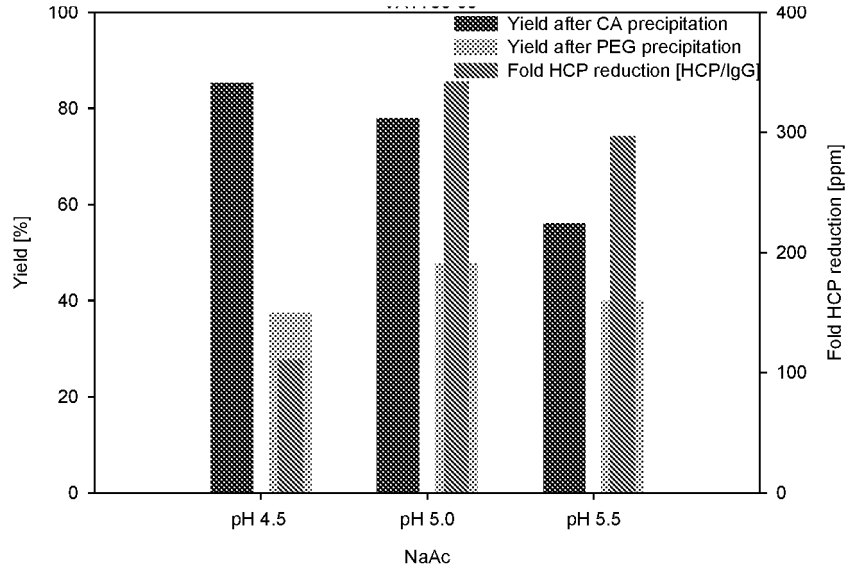


FIGURE 9

A. B03



B. B07

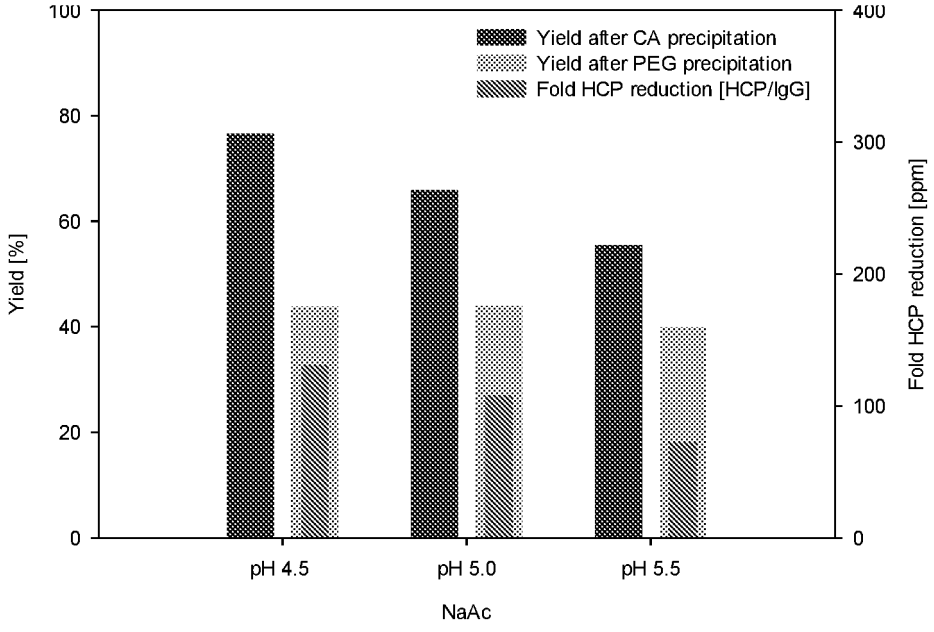
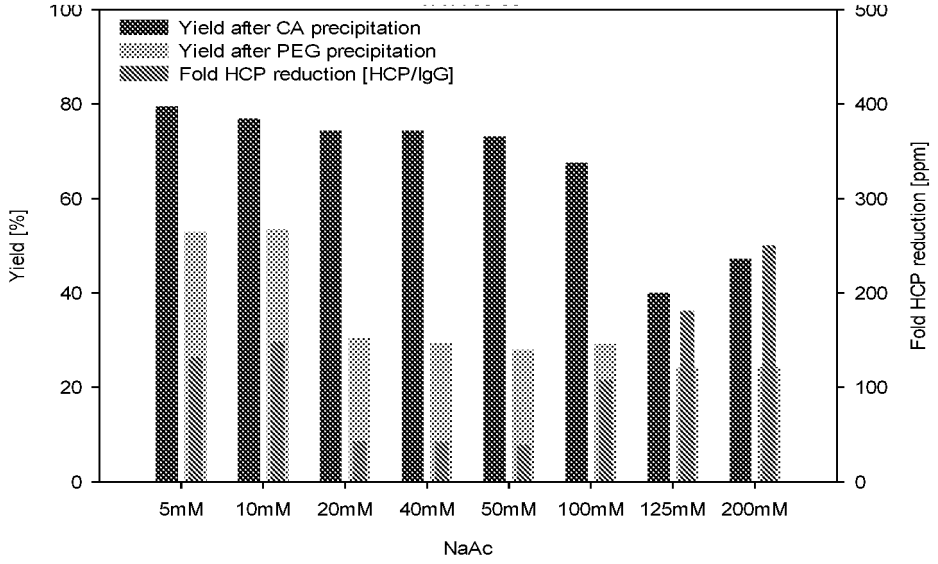


FIGURE 10

A. B03



B. B07

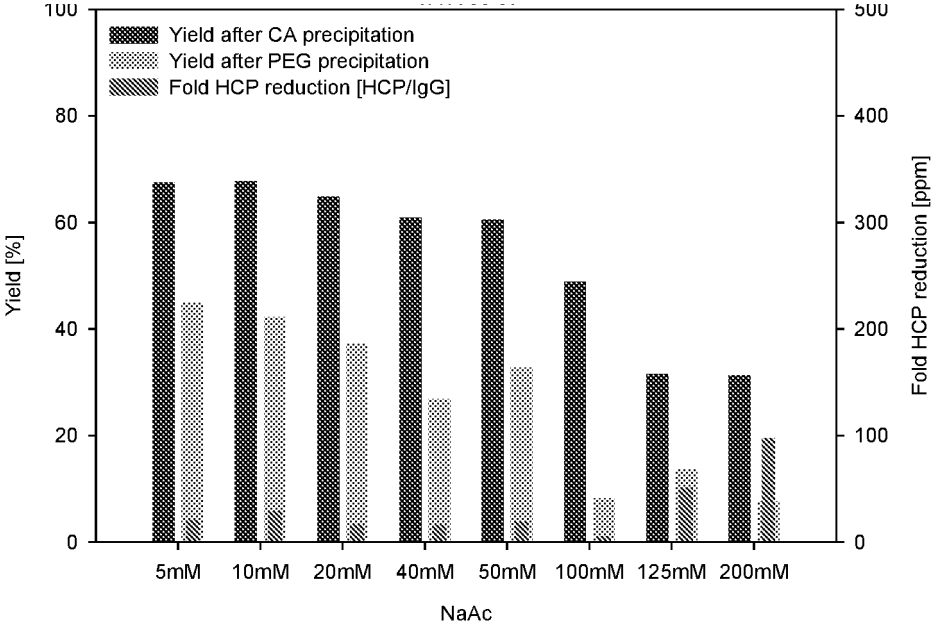
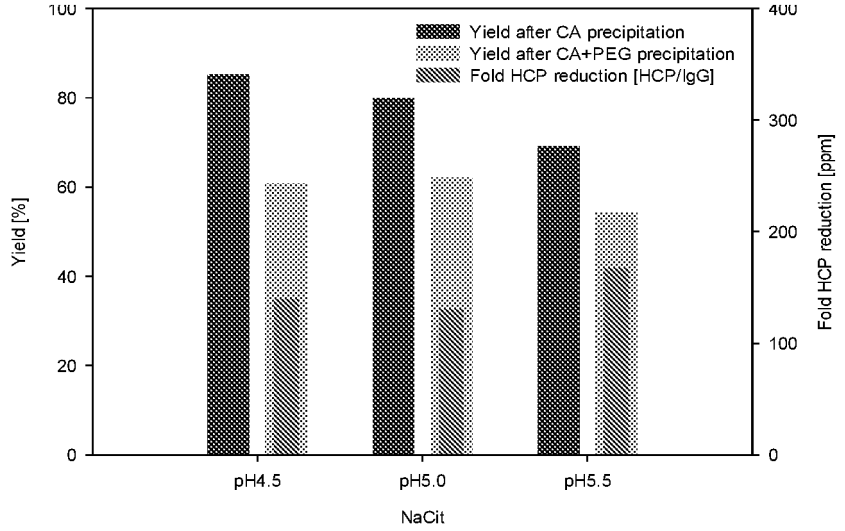


FIGURE 11

A. B03



B. B07

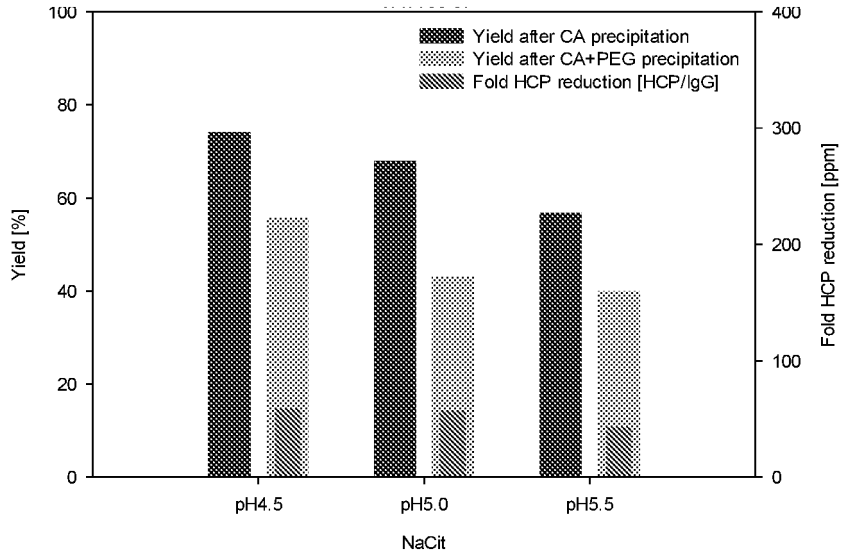
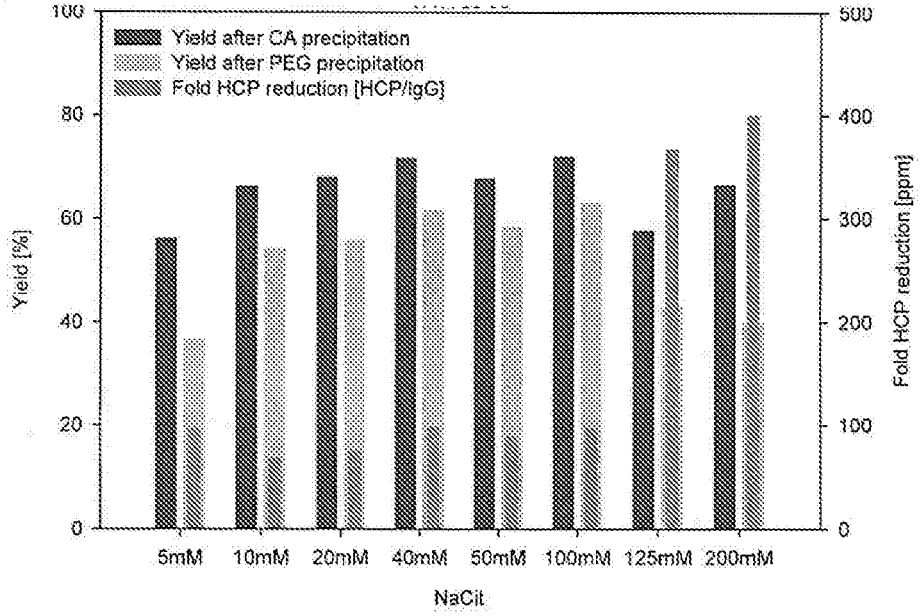


FIGURE 12

A. B03



B. B07

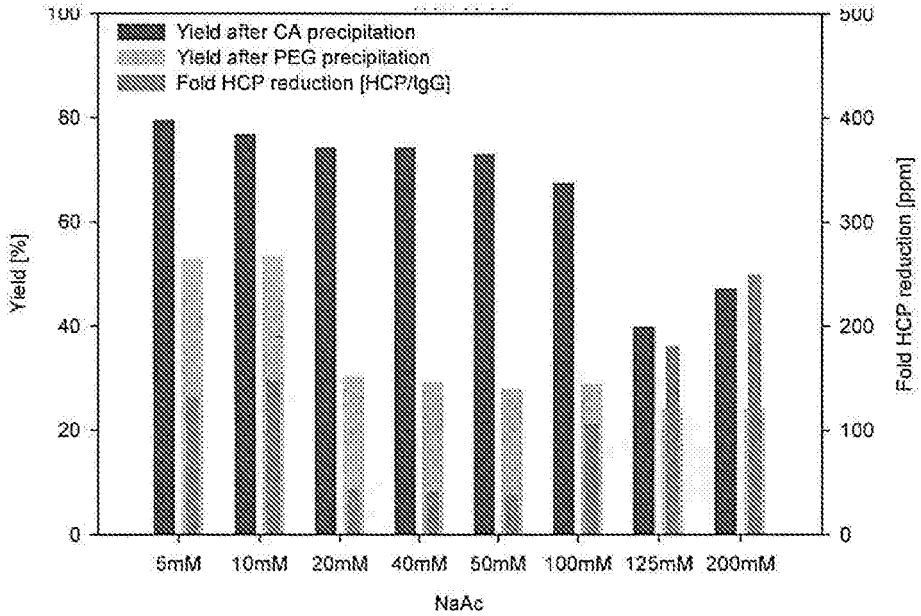
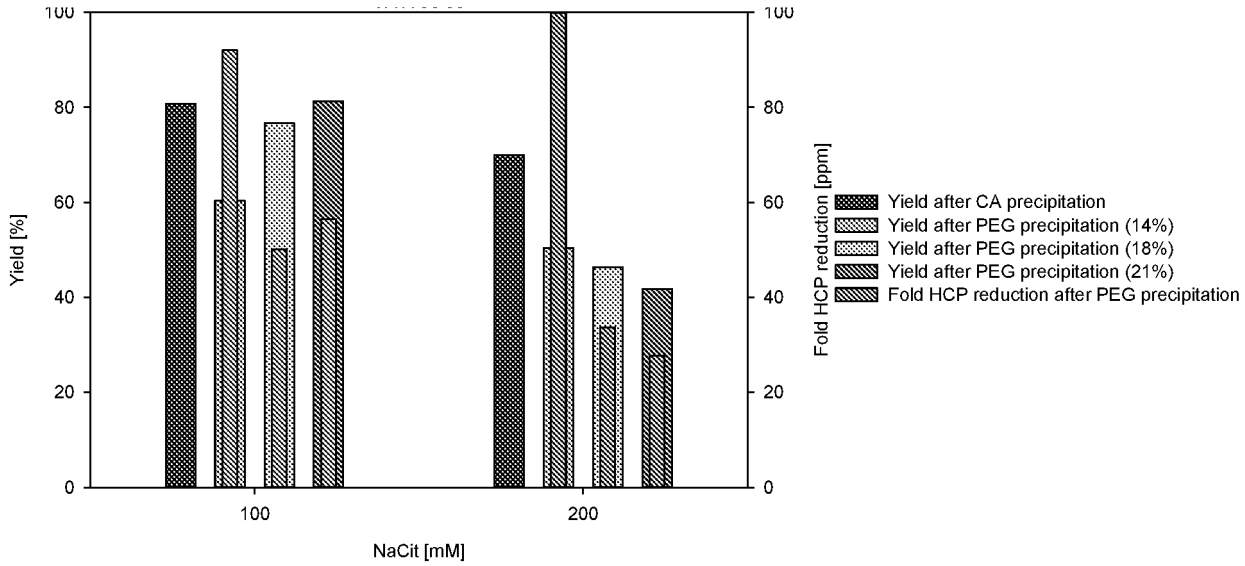


FIGURE 13

A. B03



B. B07

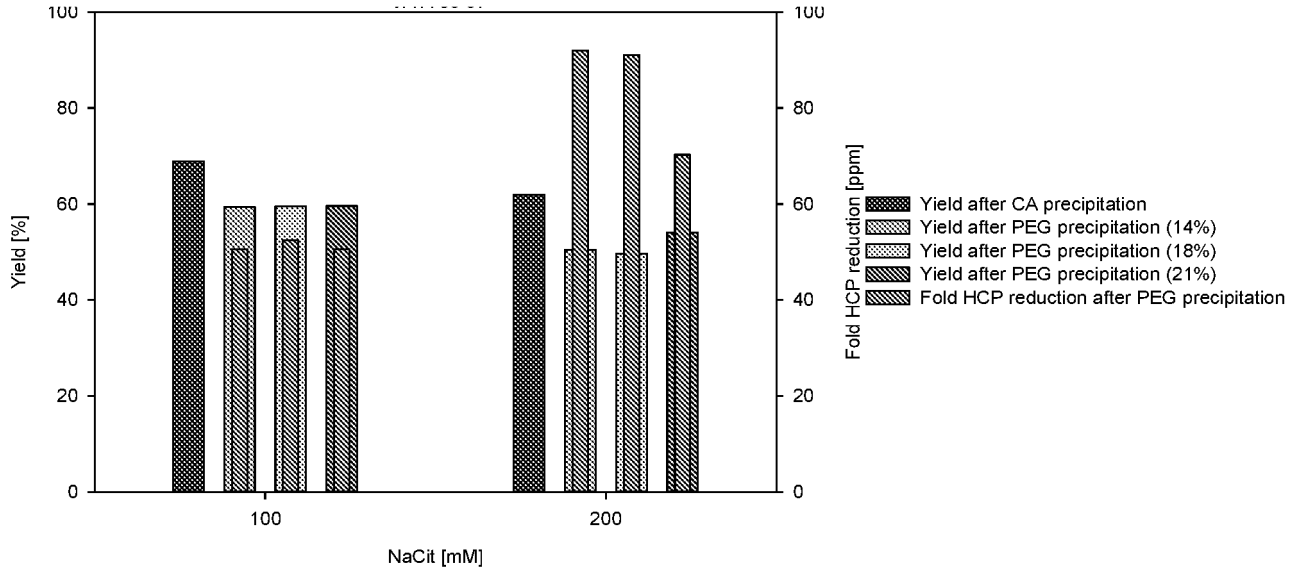
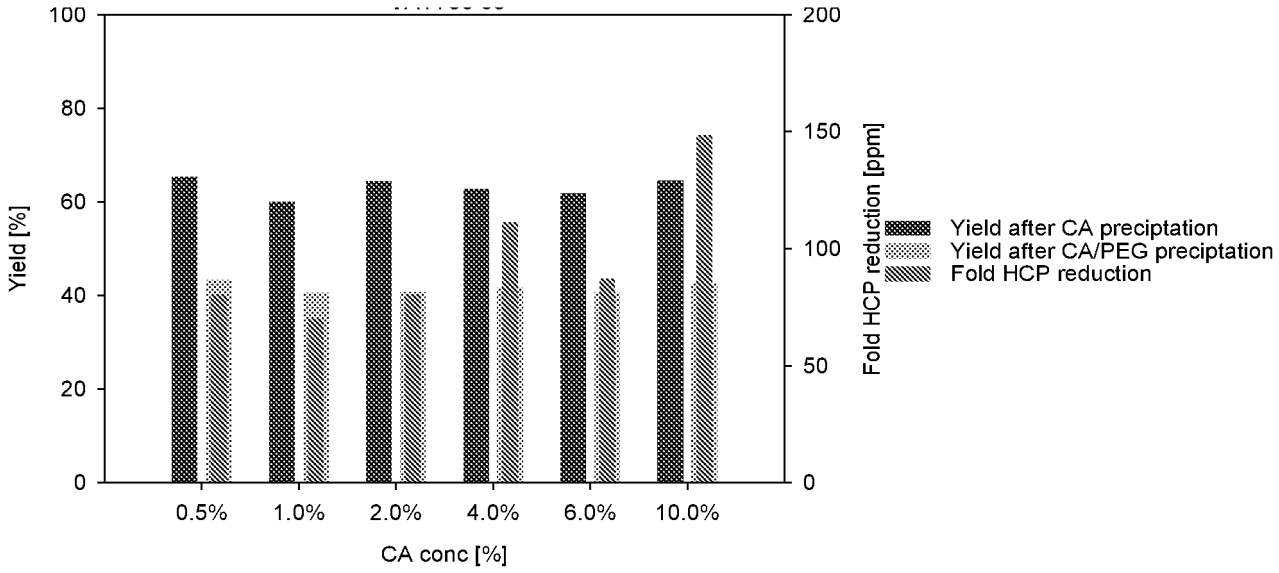


FIGURE 14

A. B03



B. B07

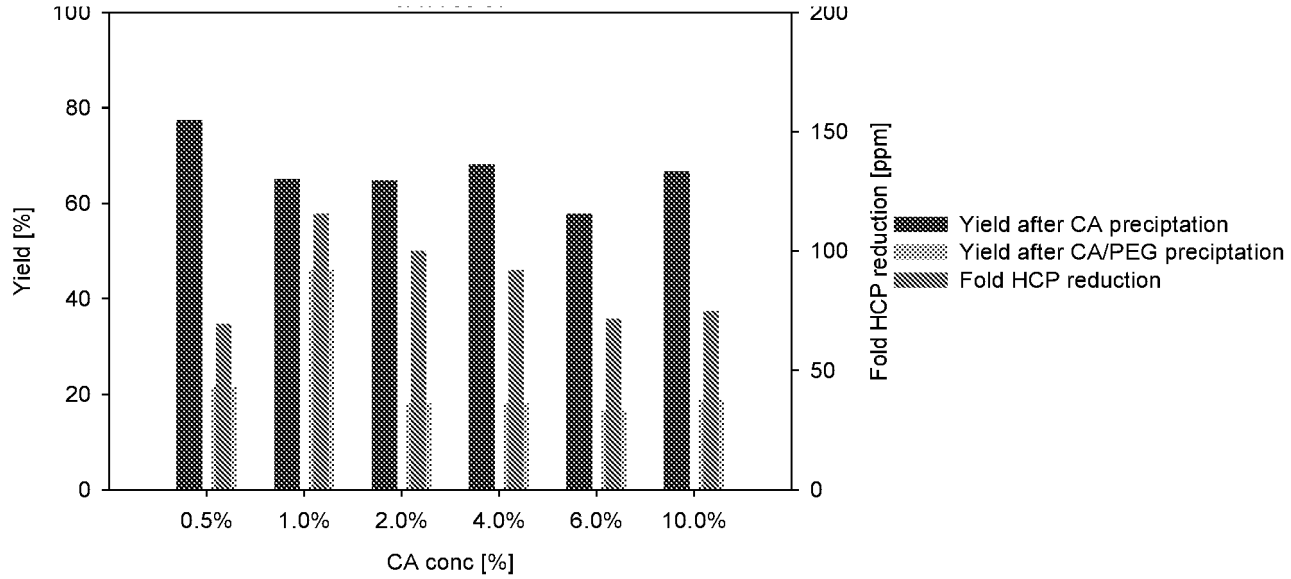
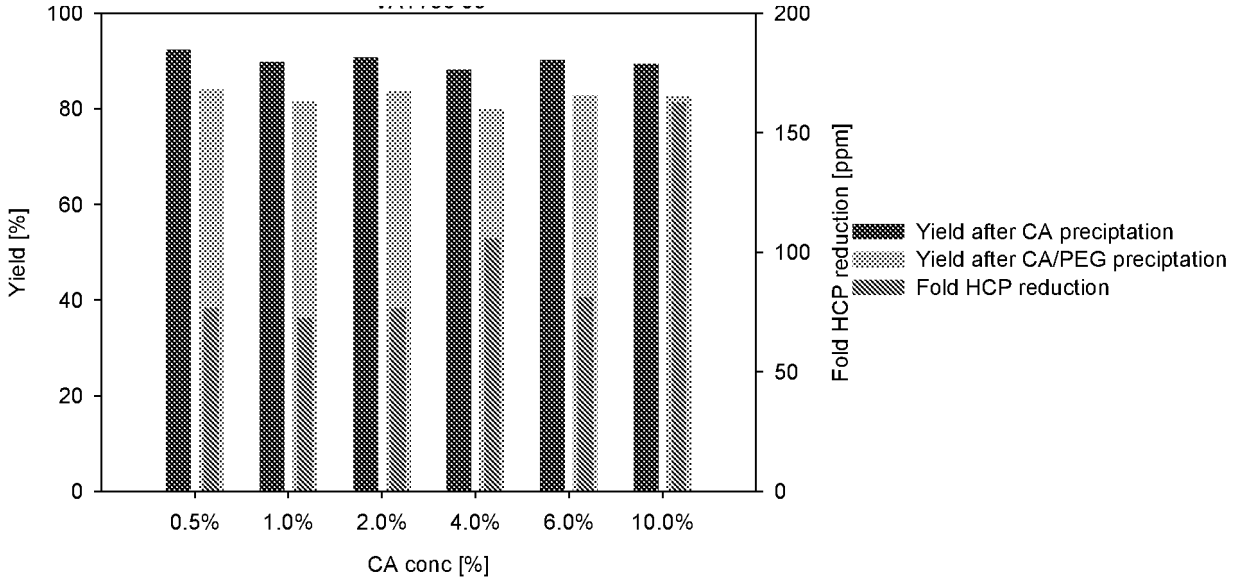


FIGURE 15

A. B03



B. B07

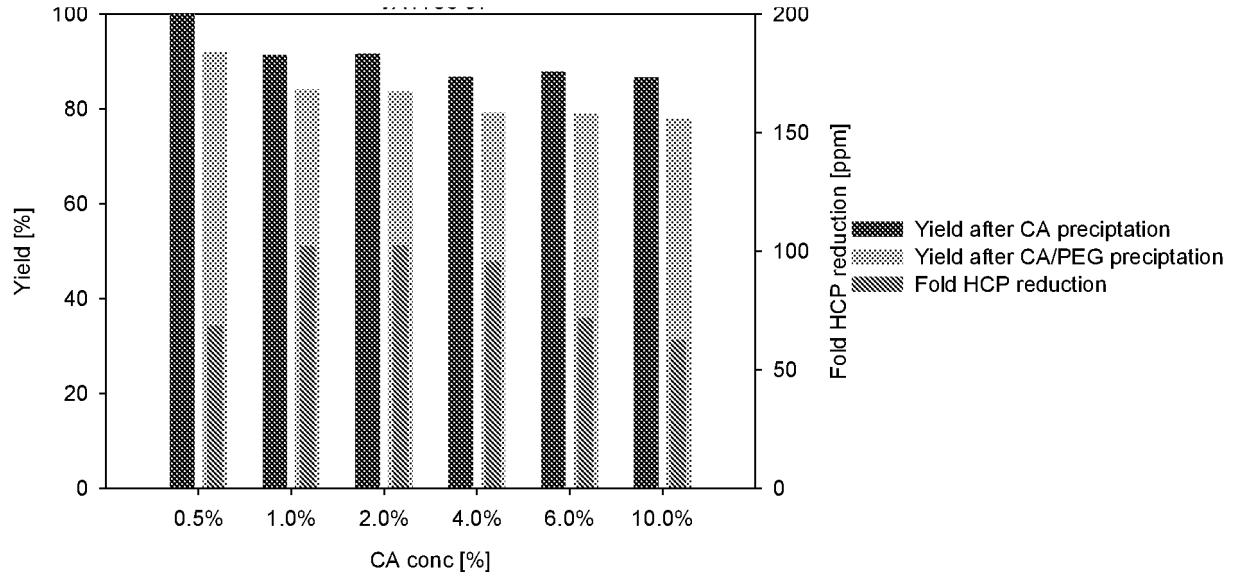
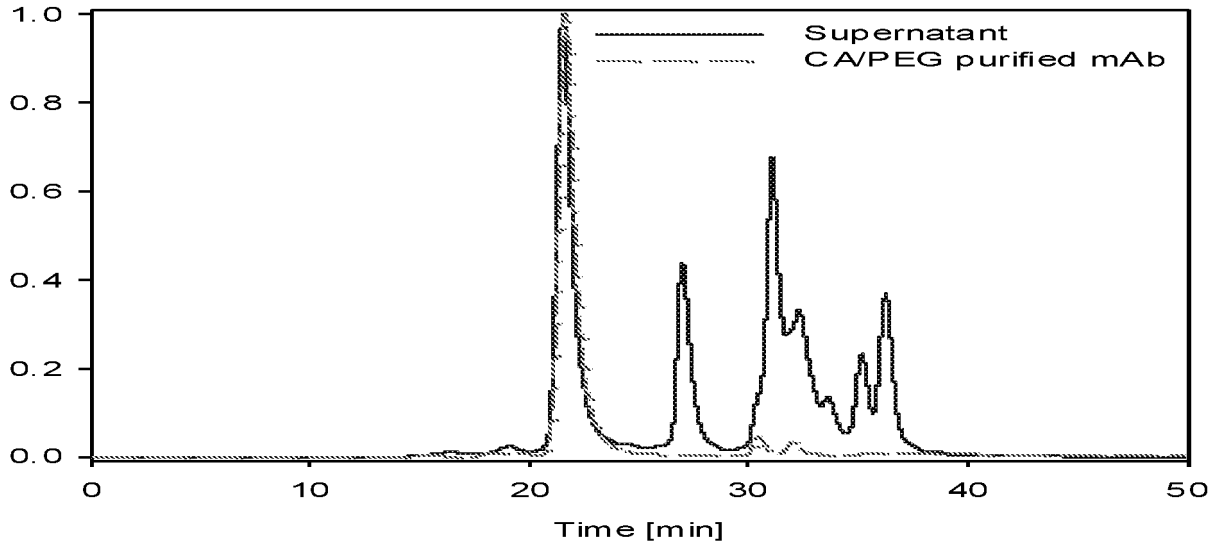


FIGURE 16

A. B03



B. B07

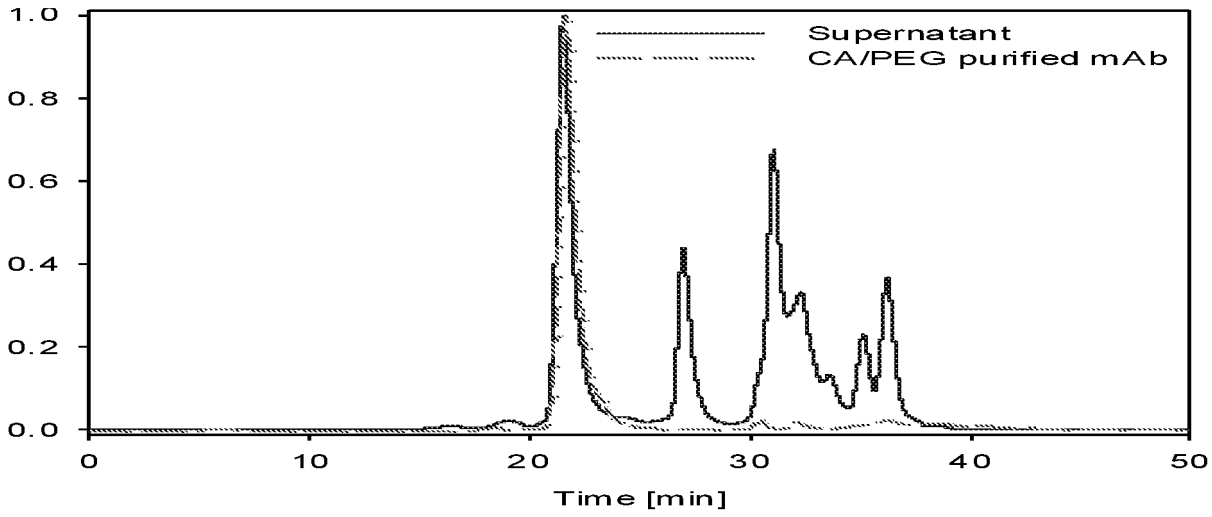
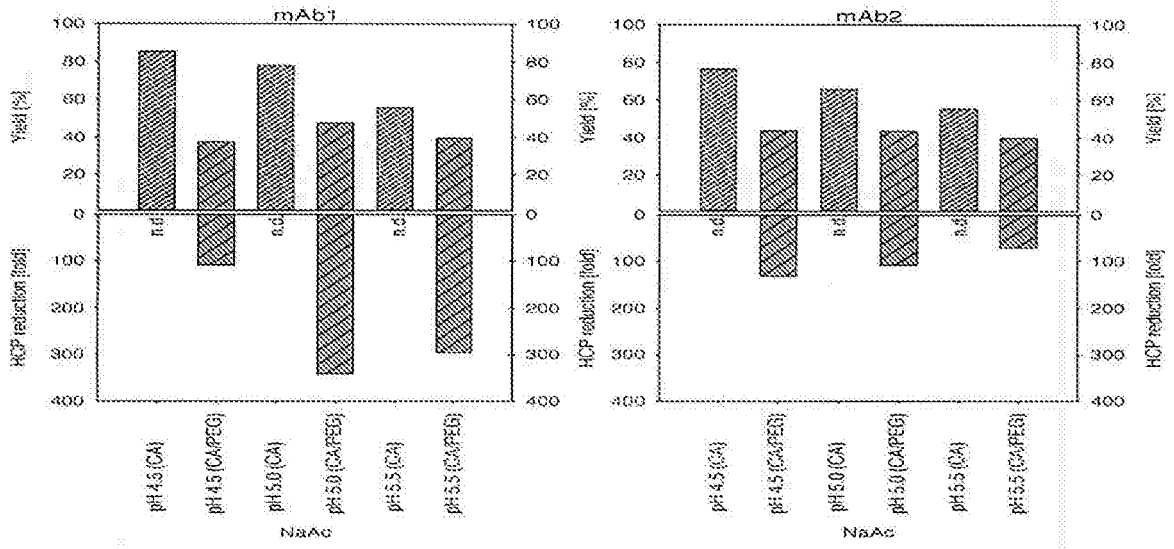


FIGURE 17A-B

A.



B.

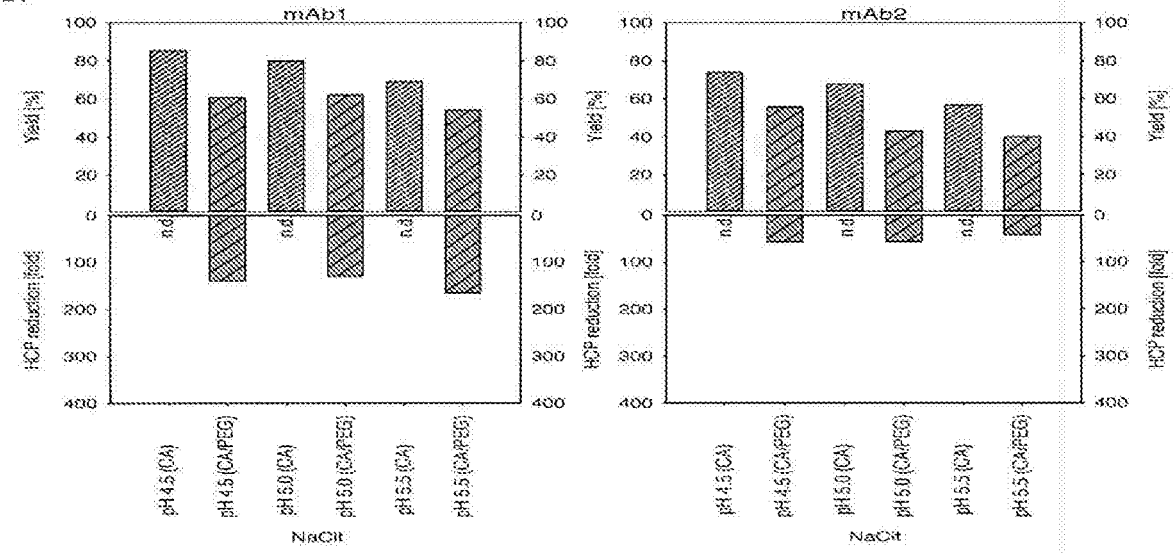
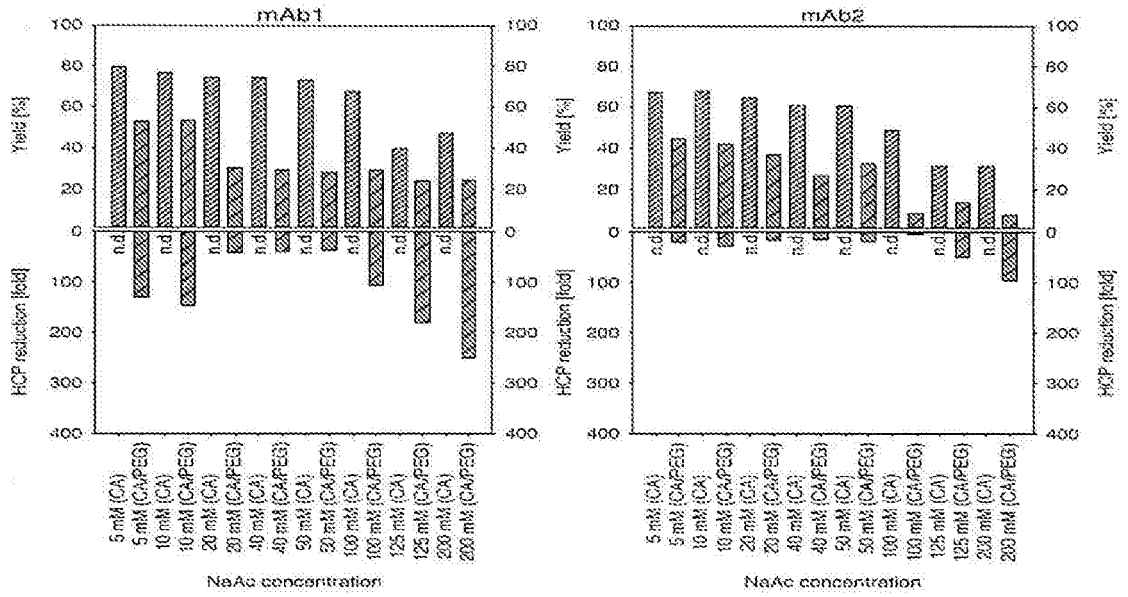


FIGURE 17C-D

C.



D.

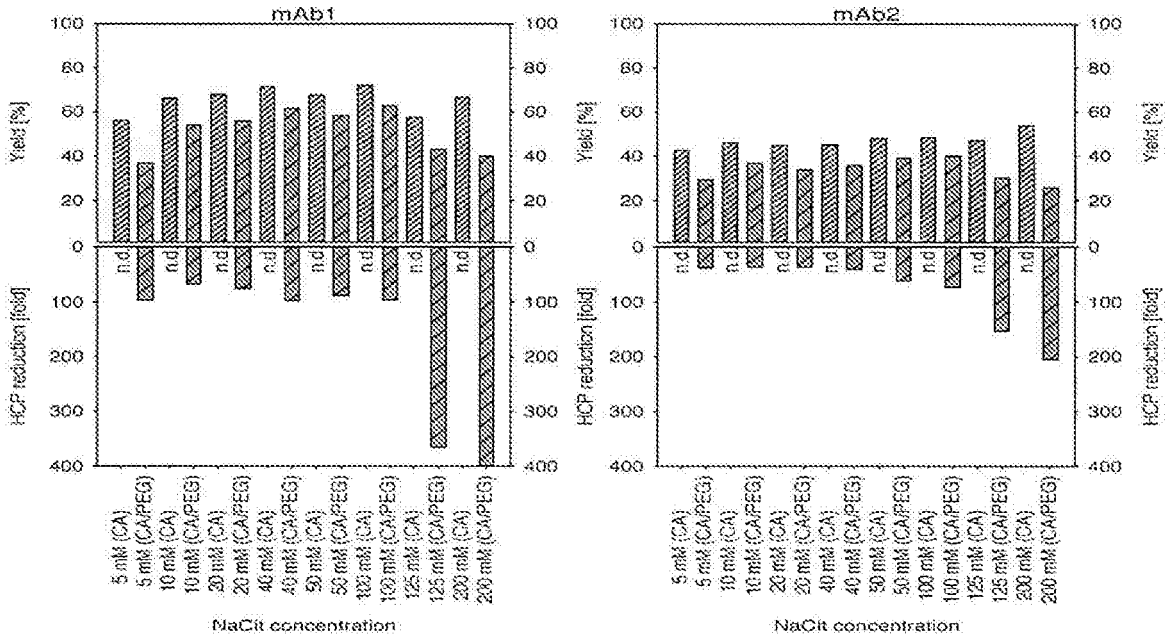
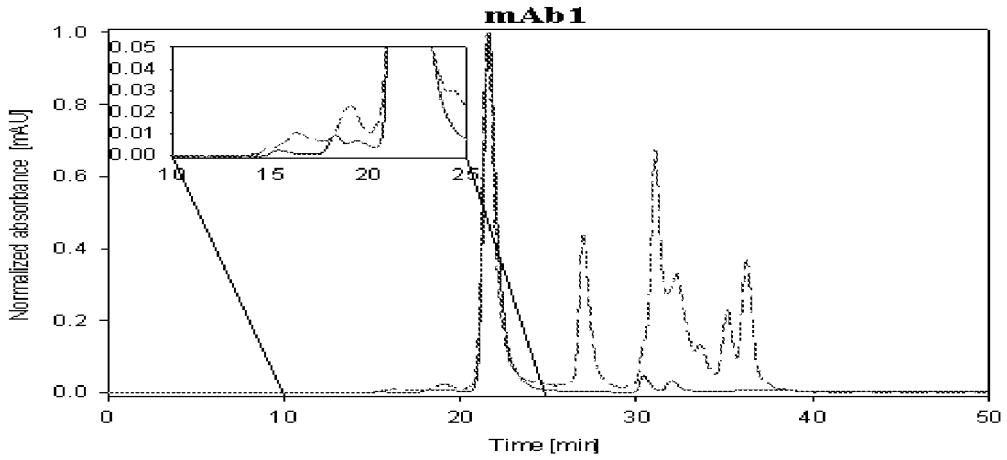


FIGURE 17E-F

E.



F.

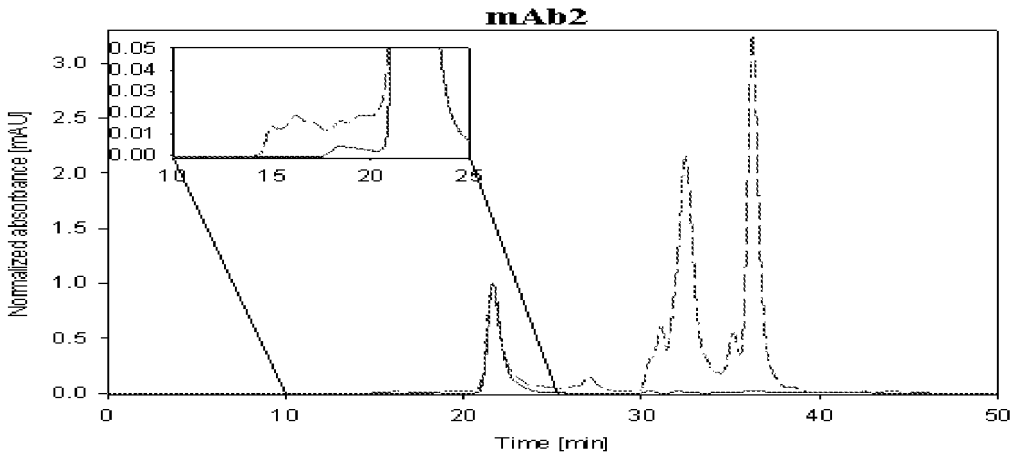
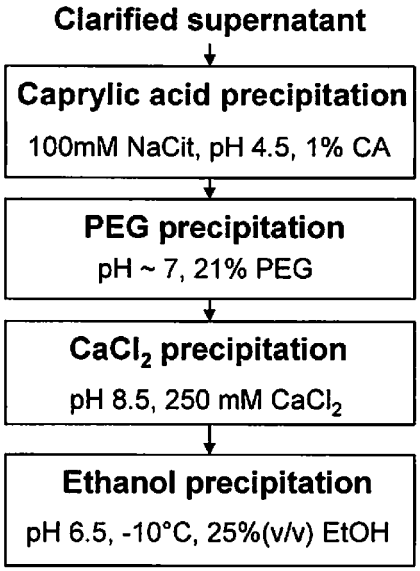


FIGURE 18

A.


Clarified supernatant
Caprylic acid precipitation
100mM NaCit, pH 4.5, 1% CA
PEG precipitation
pH ~ 7, 21% PEG
CaCl2 precipitation
pH 8.5, 250 mM CaCl2
Ethanol precipitation
pH 6.5, -10°C, 25%(v/v) EtOH

B.

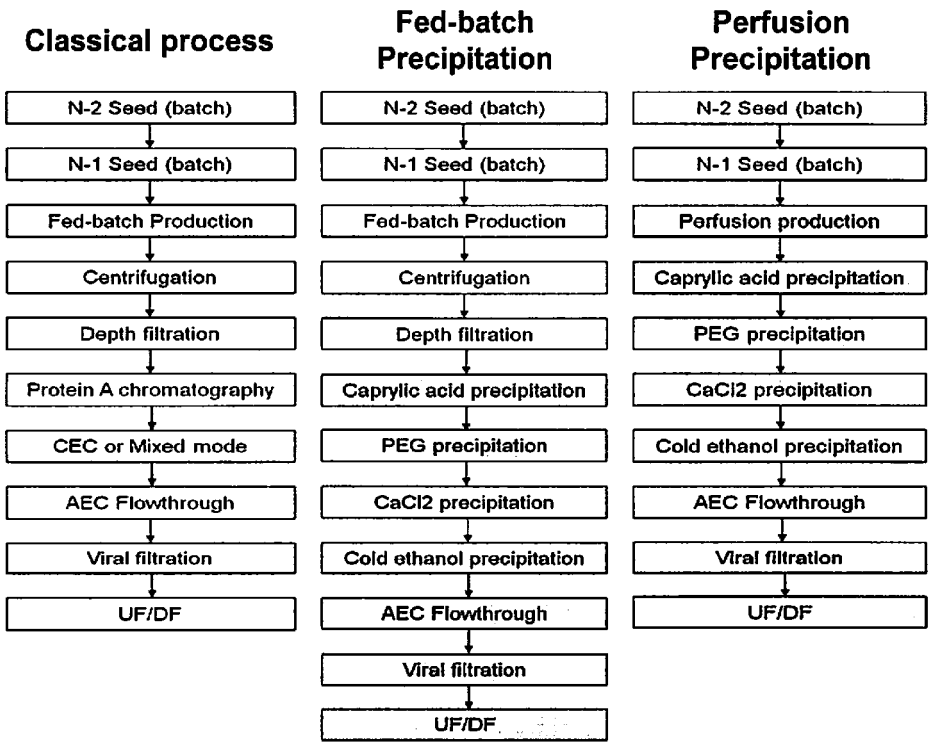
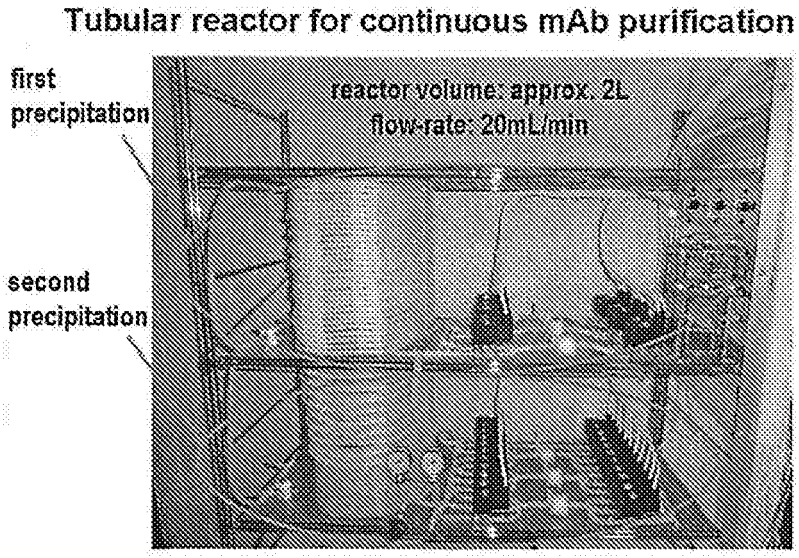

Classical process
N-2 Seed (batch)
N-1 Seed (batch)
Fed-batch Production
Centrifugation
Depth filtration
Protein A chromatography
CEC or Mixed mode
AEC Flowthrough
Viral filtration
UF/DF
Fed-batch Precipitation
N-2 Seed (batch)
N-1 Seed (batch)
Fed-batch Production
Centrifugation
Depth filtration
Caprylic acid precipitation
PEG precipitation
CaCl2 precipitation
Cold ethanol precipitation
AEC Flowthrough
Viral filtration
UF/DF
Perfusion Precipitation
N-2 Seed (batch)
N-1 Seed (batch)
Perfusion production
Caprylic acid precipitation
PEG precipitation
CaCl2 precipitation
Cold ethanol precipitation
AEC Flowthrough
Viral filtration
UF/DF

FIGURE 19


Tubular reactor for continuous mAb purification
first precipitation
second precipitation
reactor volume: approx. 2L
flow-rate: 20mL/min