Figure 1

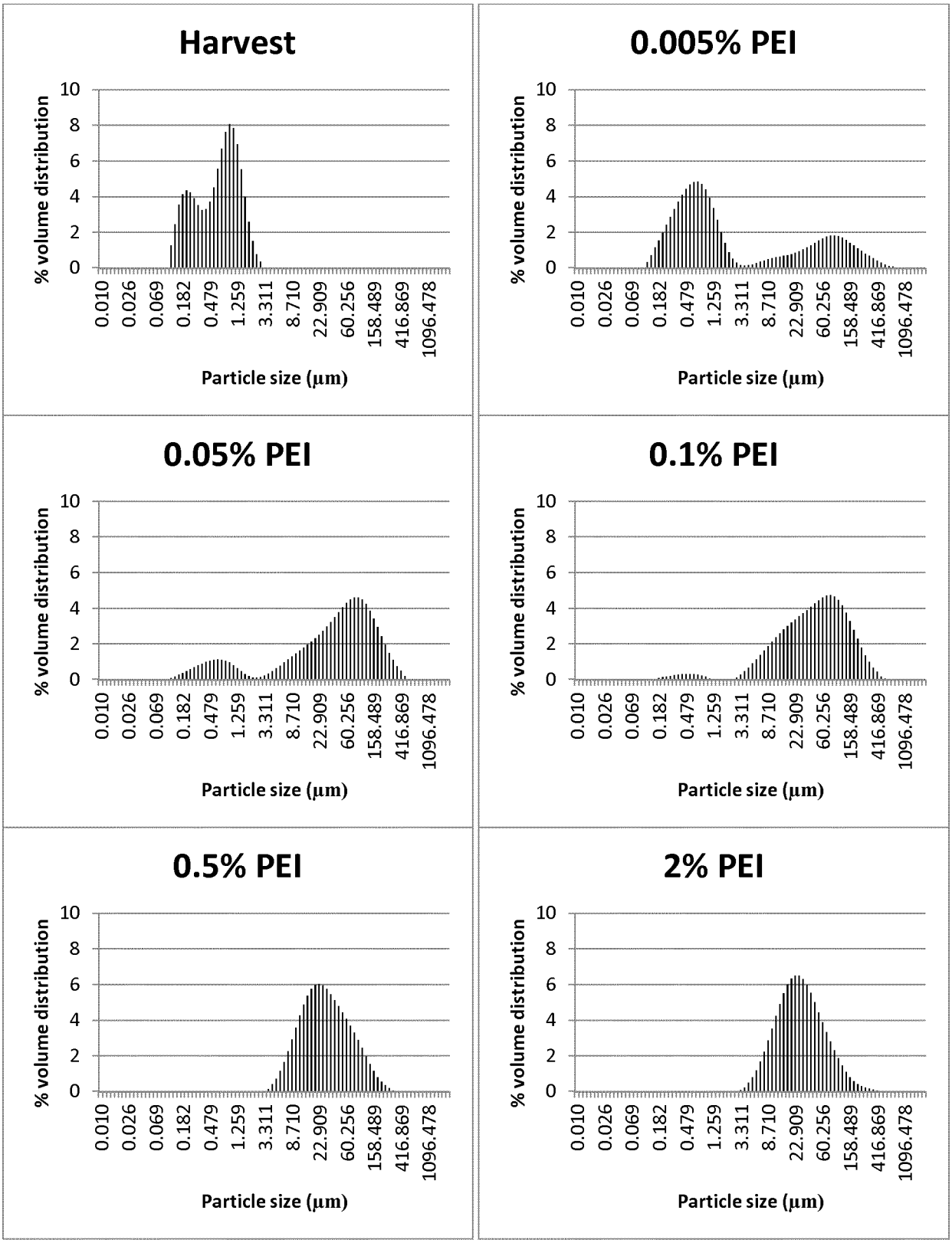

Harvest
0.005% PEI
0.05% PEI
0.1% PEI
0.5% PEI
2% PEI
% volume distribution
0
2
4
6
8
10
0.010
0.026
0.069
0.182
0.479
1.259
3.311
8.710
22.909
60.256
158.489
416.869
1096.478
Particle size (µm)

Figure 2

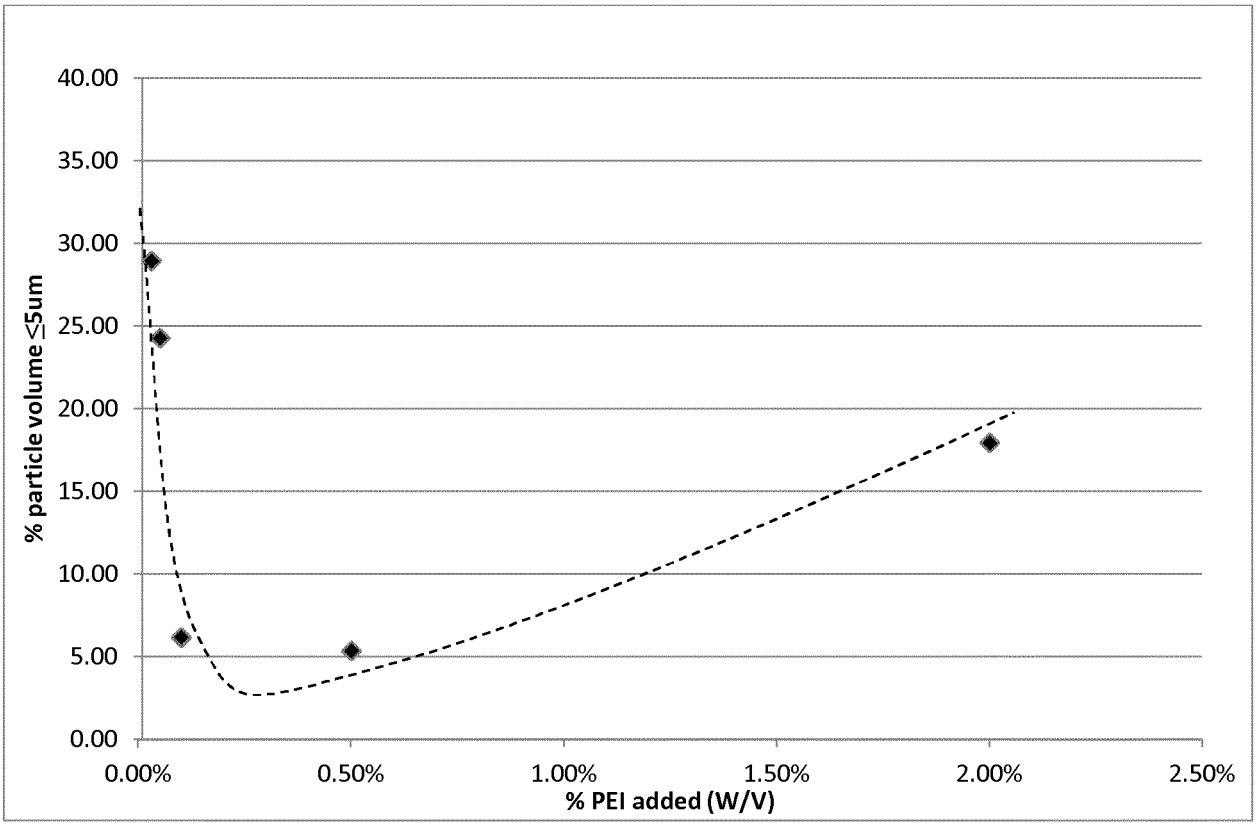

40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
% particle volume ≤5um
0.00%
0.50%
1.00%
1.50%
2.00%
2.50%
% PEI added (W/V)

Figure 3

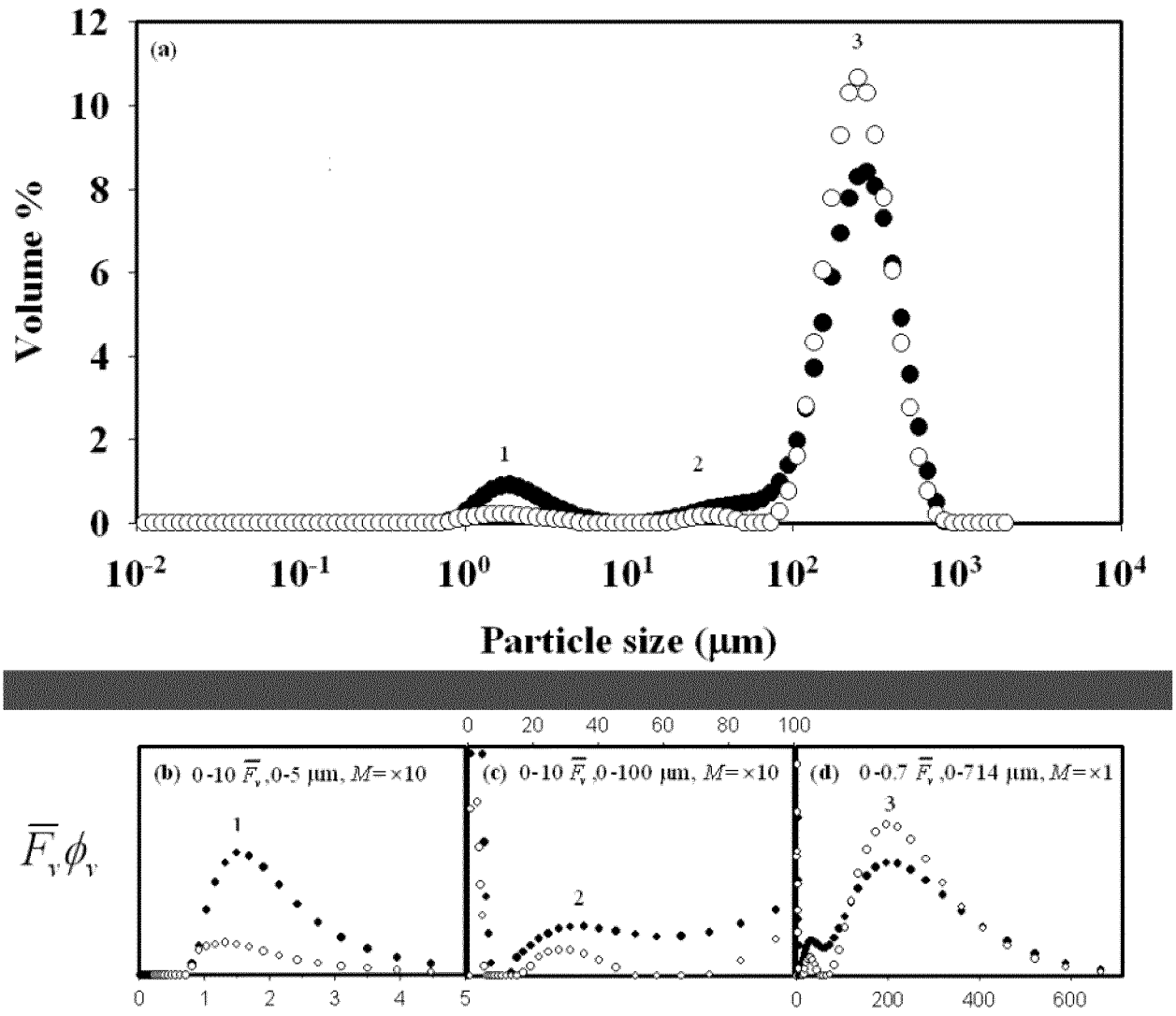

(a)
Volume %
Particle size (μm)
(b) 0-10 $\overline{F}_v$,0-5 μm, M=×10
(c) 0-10 $\overline{F}_v$,0-100 μm, M=×10
(d) 0-0.7 $\overline{F}_v$,0-714 μm, M=×1
$\overline{F}_v\phi_v$

Figure 4

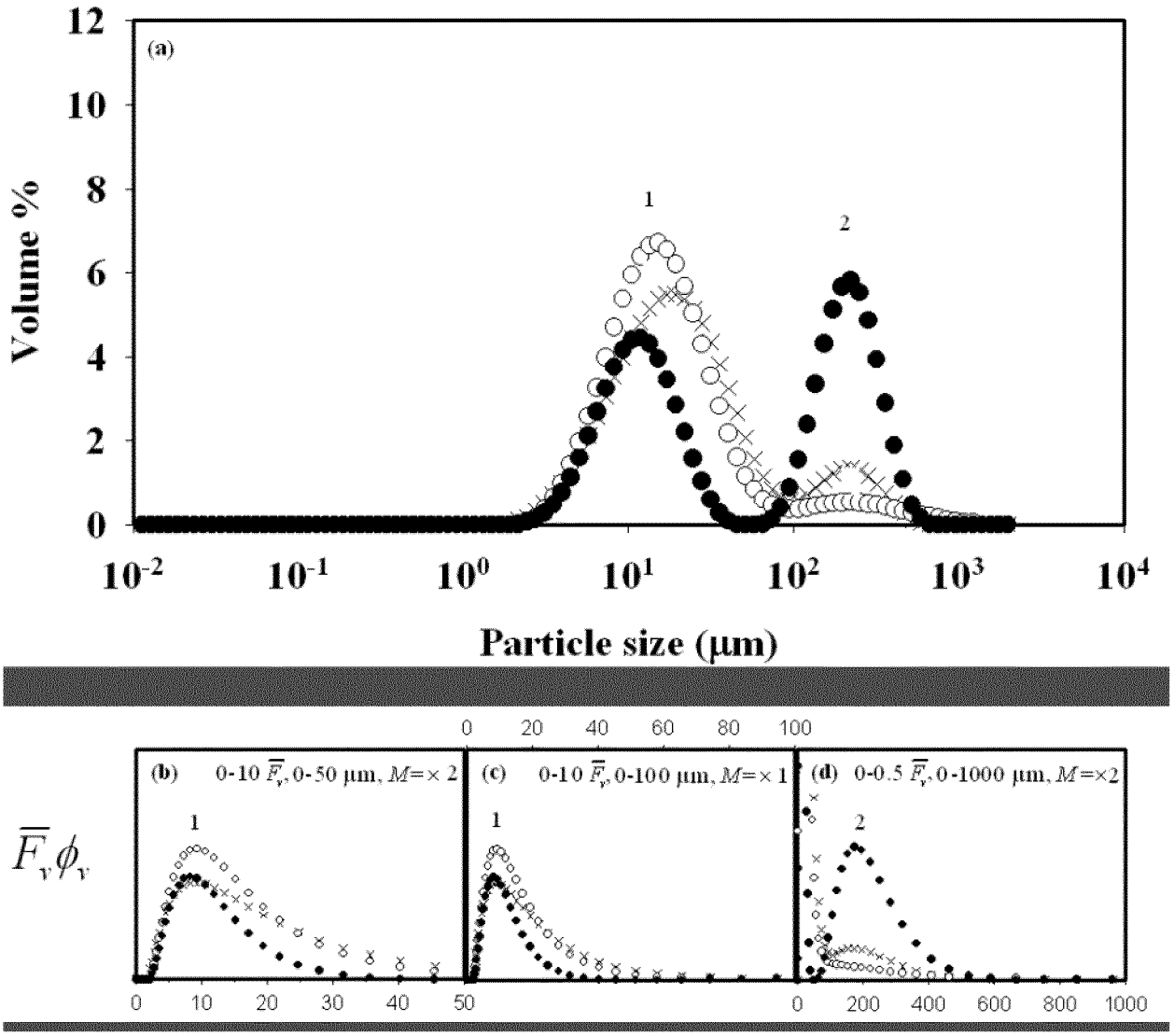

(a)
Volume %
Particle size (μm)
1
2
(b) 0-10 $\overline{F}_v$, 0-50 μm, M=× 2
(c) 0-10 $\overline{F}_v$, 0-100 μm, M=× 1
(d) 0-0.5 $\overline{F}_v$, 0-1000 μm, M=×2
$\overline{F}_v\phi_v$

Figure 5

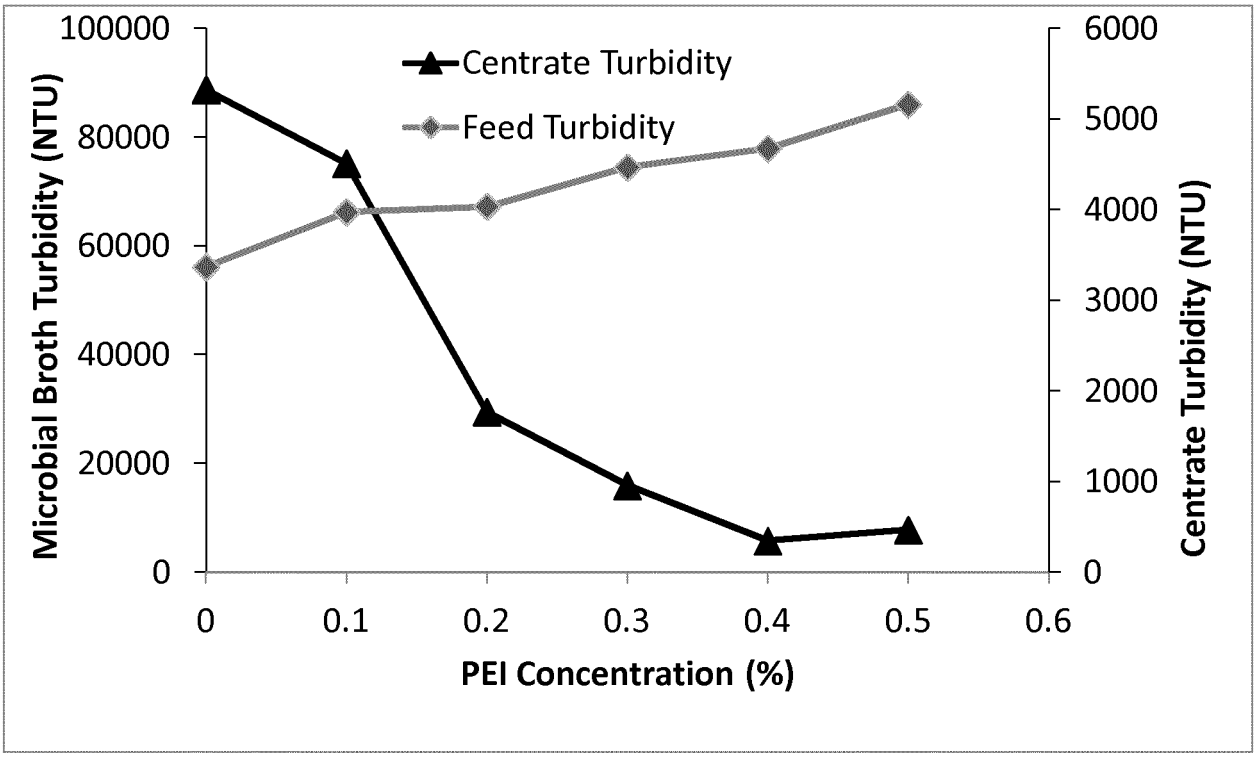
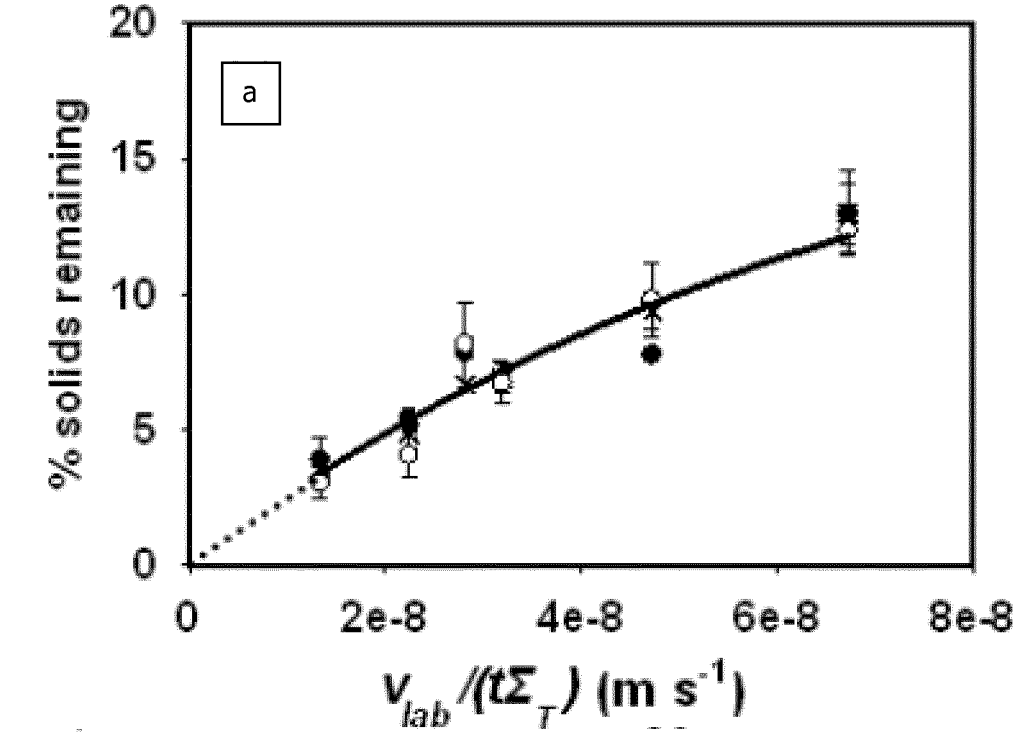

Centrate Turbidity
Feed Turbidity
Microbial Broth Turbidity (NTU)
Centrate Turbidity (NTU)
PEI Concentration (%)
100000
80000
60000
40000
20000
0
6000
5000
4000
3000
2000
1000
0
0
0.1
0.2
0.3
0.4
0.5
0.6

Figure 6


a
% solids remaining
20
15
10
5
0
0
2e-8
4e-8
6e-8
8e-8
$v_{lab}/(t\Sigma_T)$ (m s^{-1})

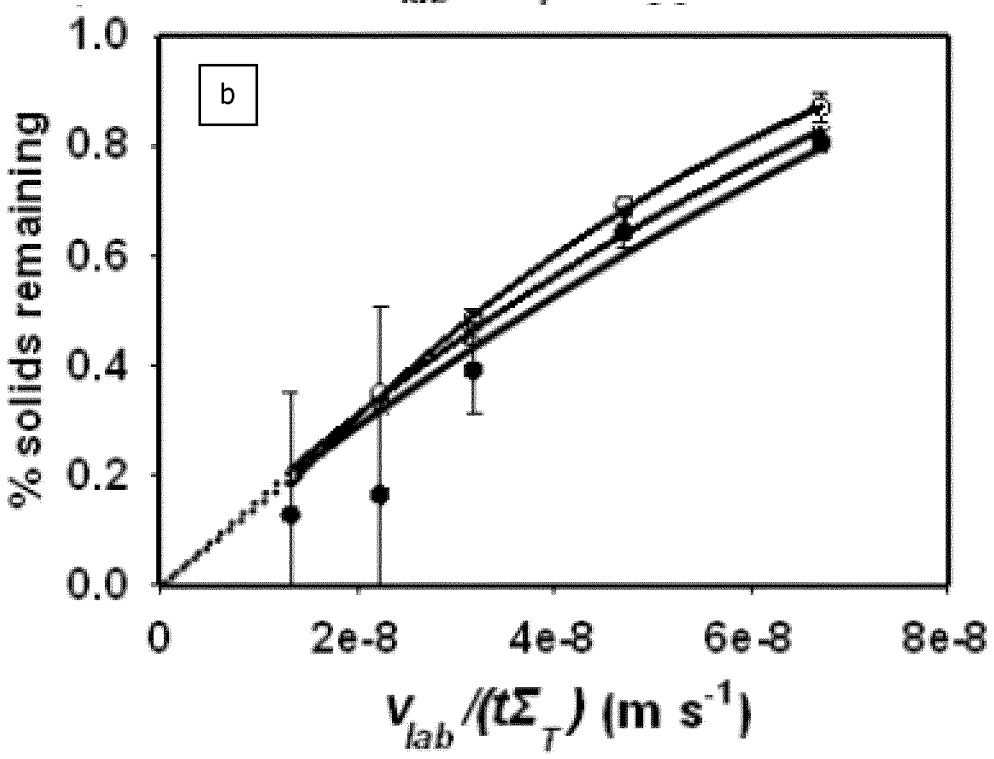

b
% solids remaining
1.0
0.8
0.6
0.4
0.2
0.0
0
2e-8
4e-8
6e-8
8e-8
$v_{lab}/(t\Sigma_T)$ (m s^{-1})

Figure 7

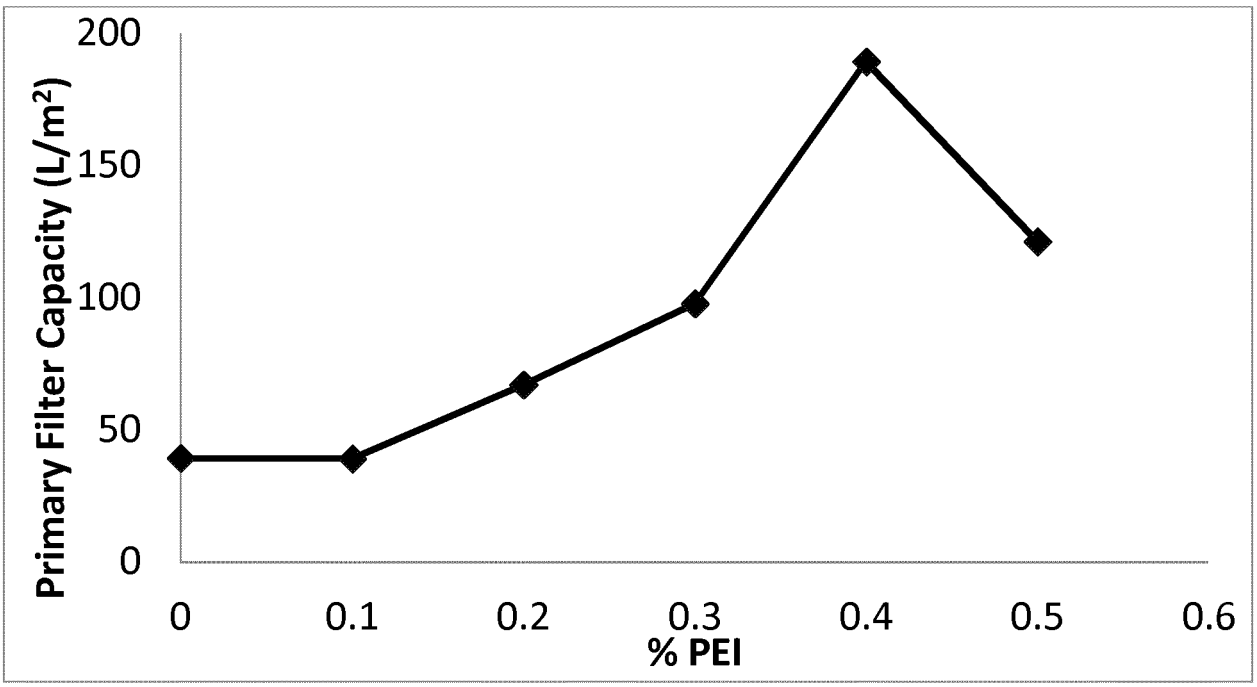

Primary Filter Capacity (L/m²)
200
150
100
50
0
0
0.1
0.2
0.3
0.4
0.5
0.6
% PEI

Figure 8

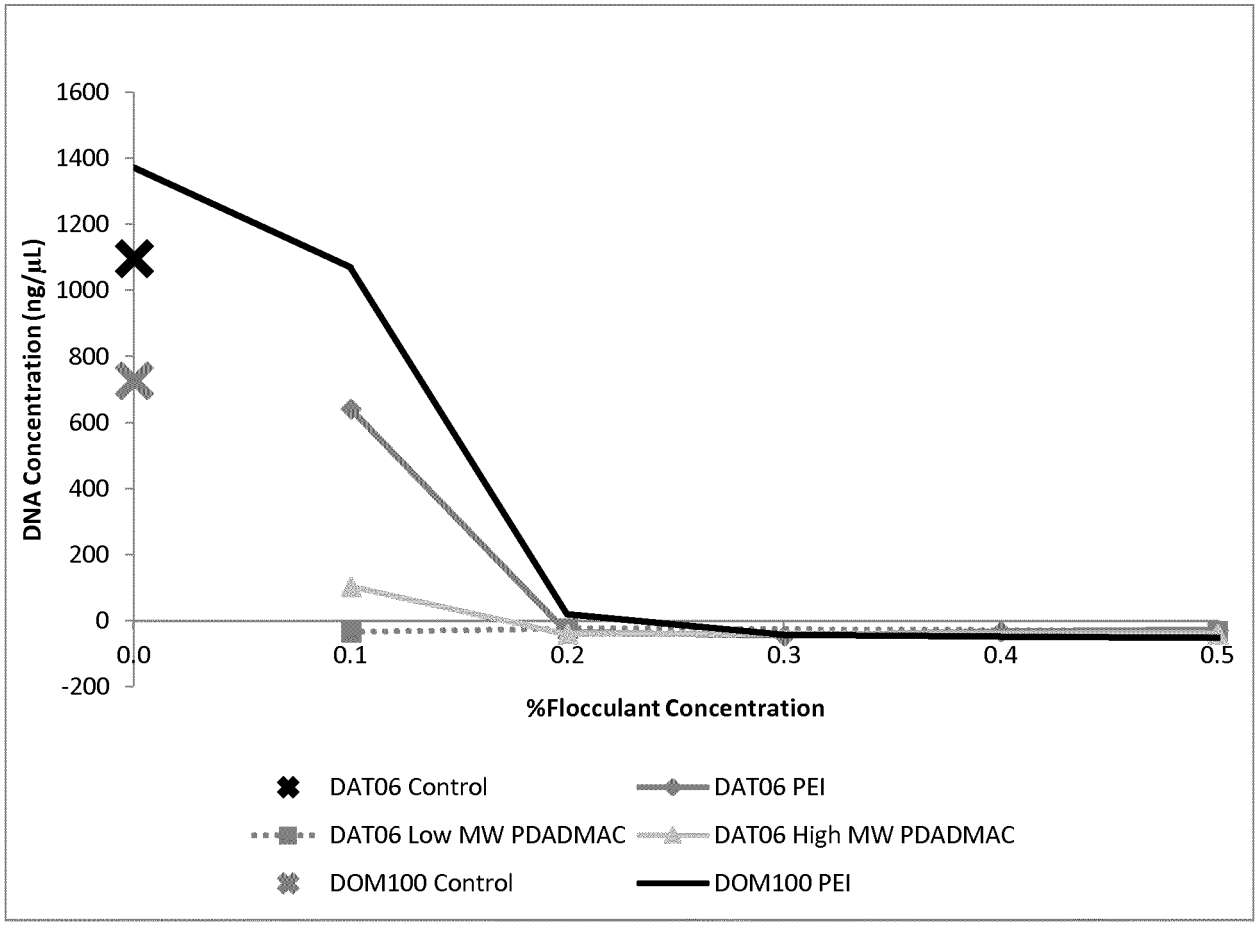

1600
1400
1200
1000
800
600
400
200
0
-200
DNA Concentration (ng/µL)
0.0
0.1
0.2
0.3
0.4
0.5
%Flocculant Concentration
DAT06 Control
DAT06 PEI
DAT06 Low MW PDADMAC
DAT06 High MW PDADMAC
DOM100 Control
DOM100 PEI

Figure 9

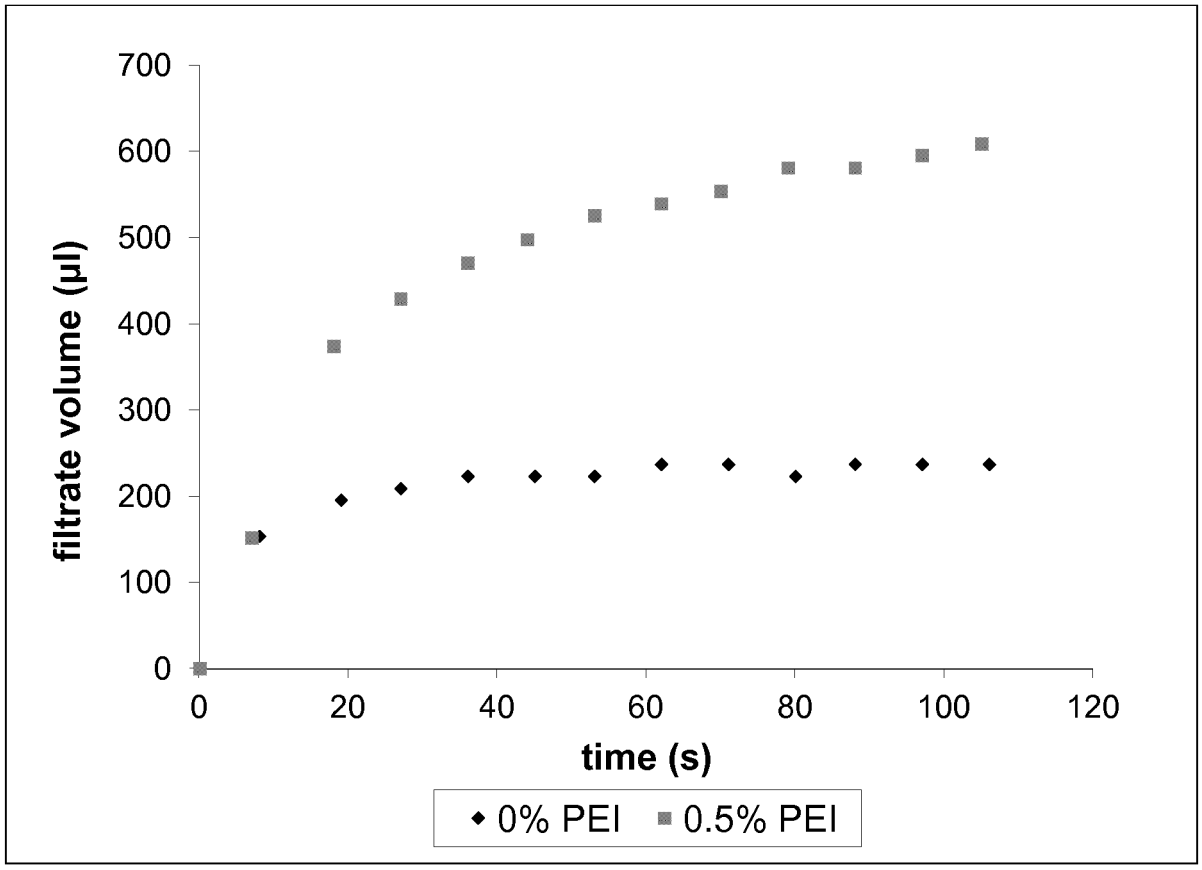

700
600
500
400
300
200
100
0
filtrate volume (µl)
0
20
40
60
80
100
120
time (s)
0% PEI
0.5% PEI

Figure 10

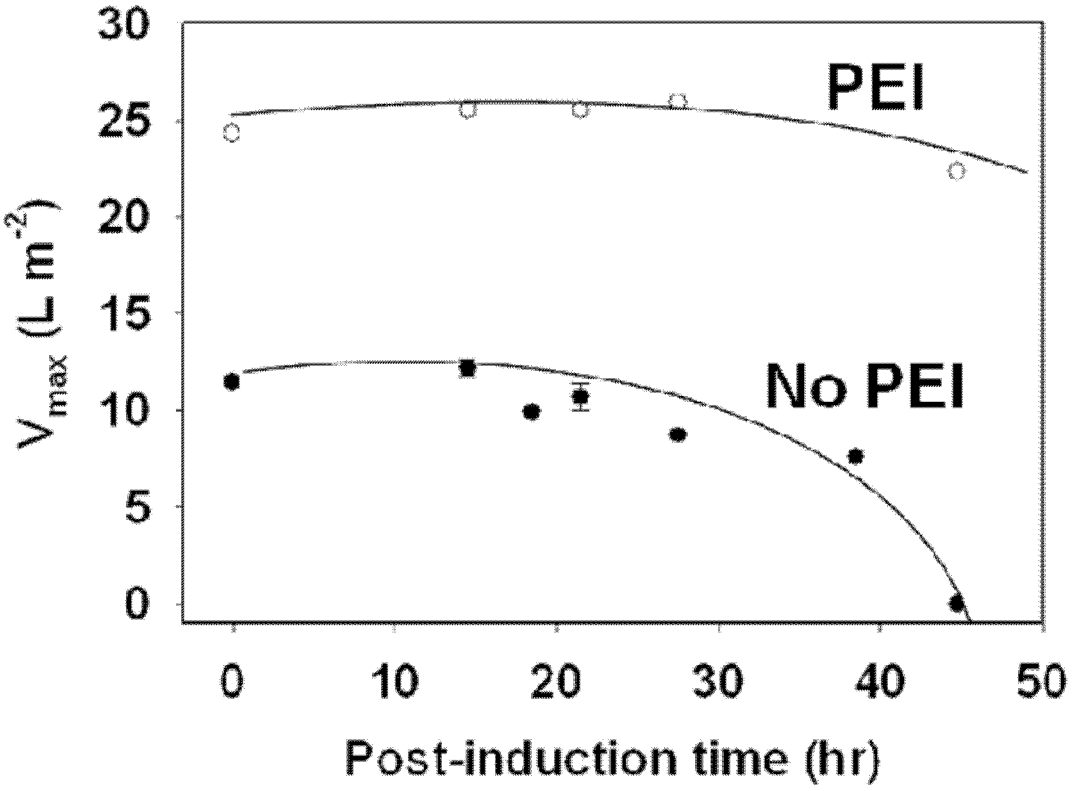

30
25
20
15
10
5
0
V_{max} (L m^{-2})
PEI
No PEI
0
10
20
30
40
50
Post-induction time (hr)

Figure 11

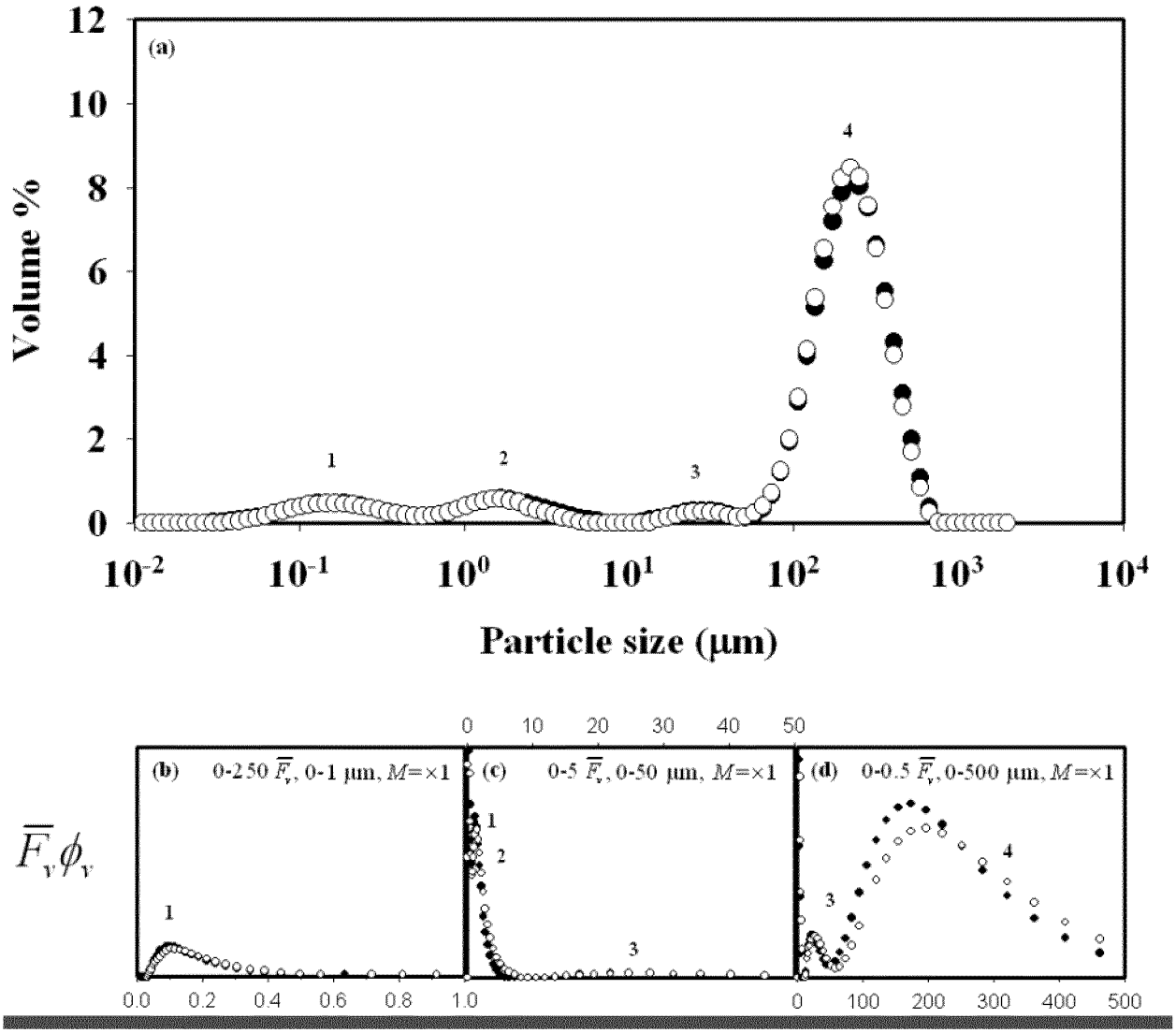

(a)
Volume %
Particle size (µm)
(b) 0-250 $\overline{F}_v$, 0-1 µm, M=×1
(c) 0-5 $\overline{F}_v$, 0-50 µm, M=×1
(d) 0-0.5 $\overline{F}_v$, 0-500 µm, M=×1
$\overline{F}_v\phi_v$

Figure 12

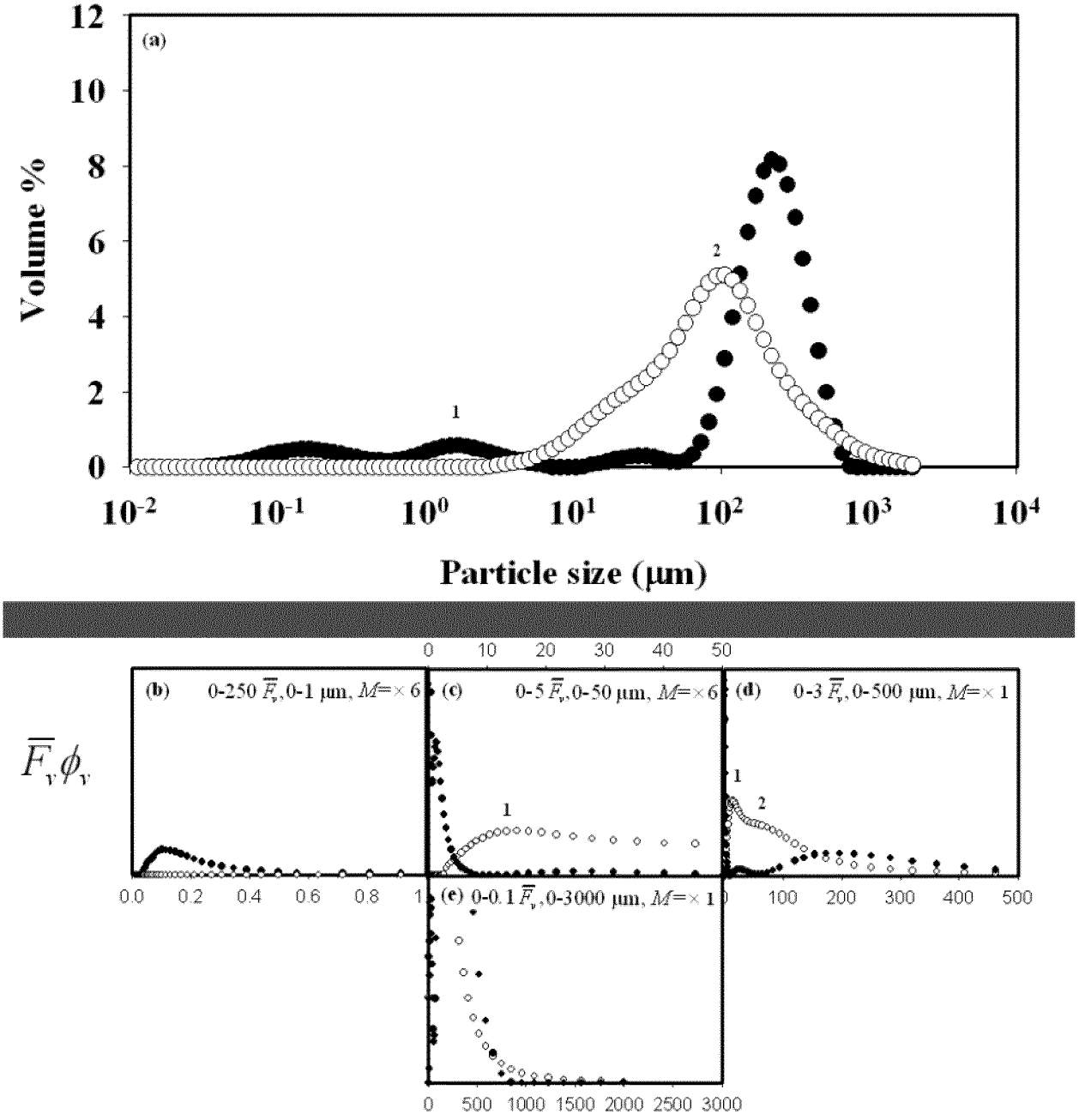

(a)
Volume %
Particle size (μm)
(b) 0-250 $\overline{F}_v$,0-1 μm, M=× 6
(c) 0-5 $\overline{F}_v$,0-50 μm, M=× 6
(d) 0-3 $\overline{F}_v$,0-500 μm, M=× 1
(e) 0-0.1 $\overline{F}_v$,0-3000 μm, M=× 1
$\overline{F}_v\phi_v$

Figure 13

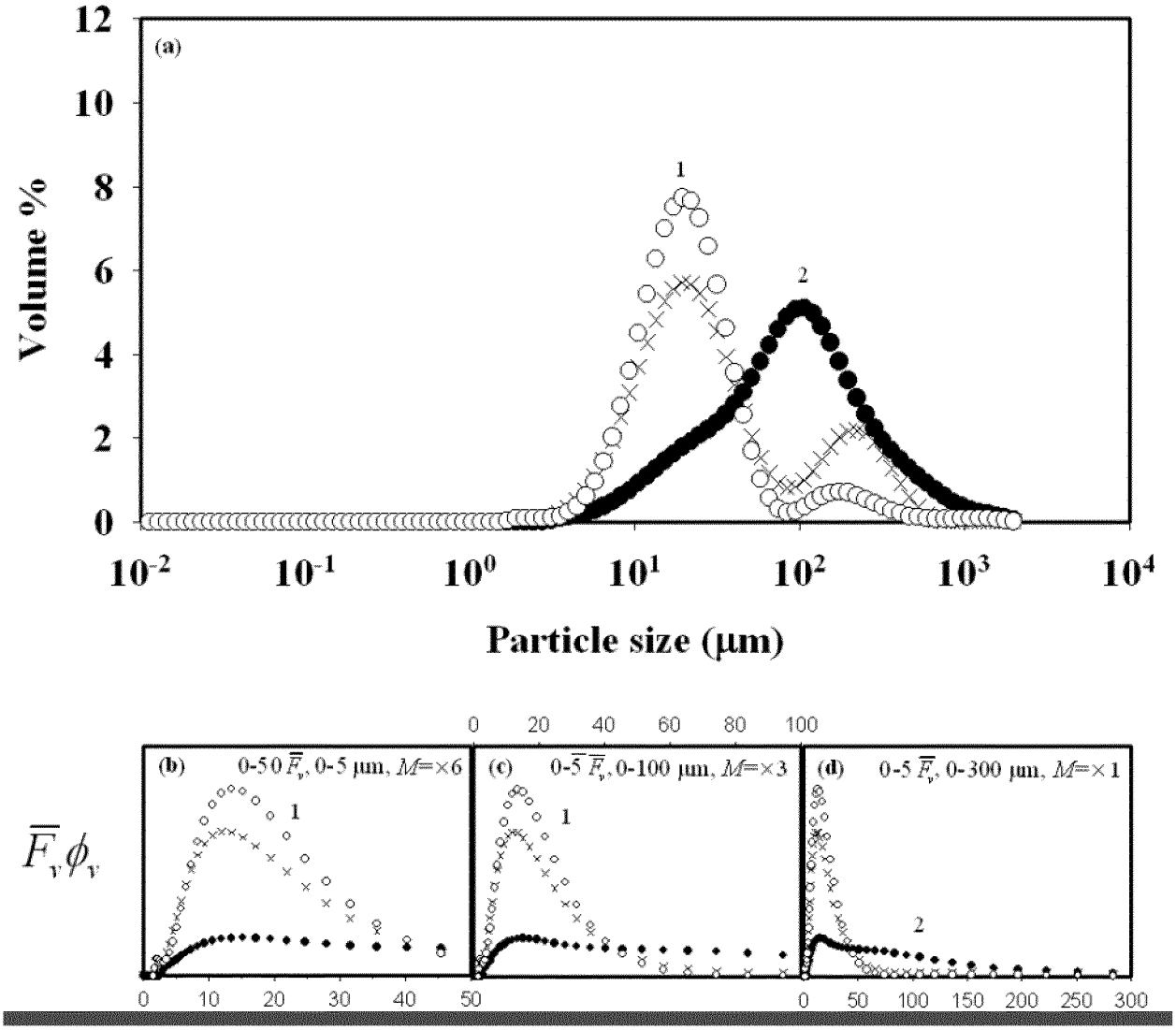

(a)
Volume %
Particle size (μm)
1
2
(b) 0-50 $\overline{F_v}$, 0-5 μm, M=×6
(c) 0-5 $\overline{F_v}$, 0-100 μm, M=×3
(d) 0-5 $\overline{F_v}$, 0-300 μm, M=×1
$\overline{F_v}\phi_v$

Figure 14

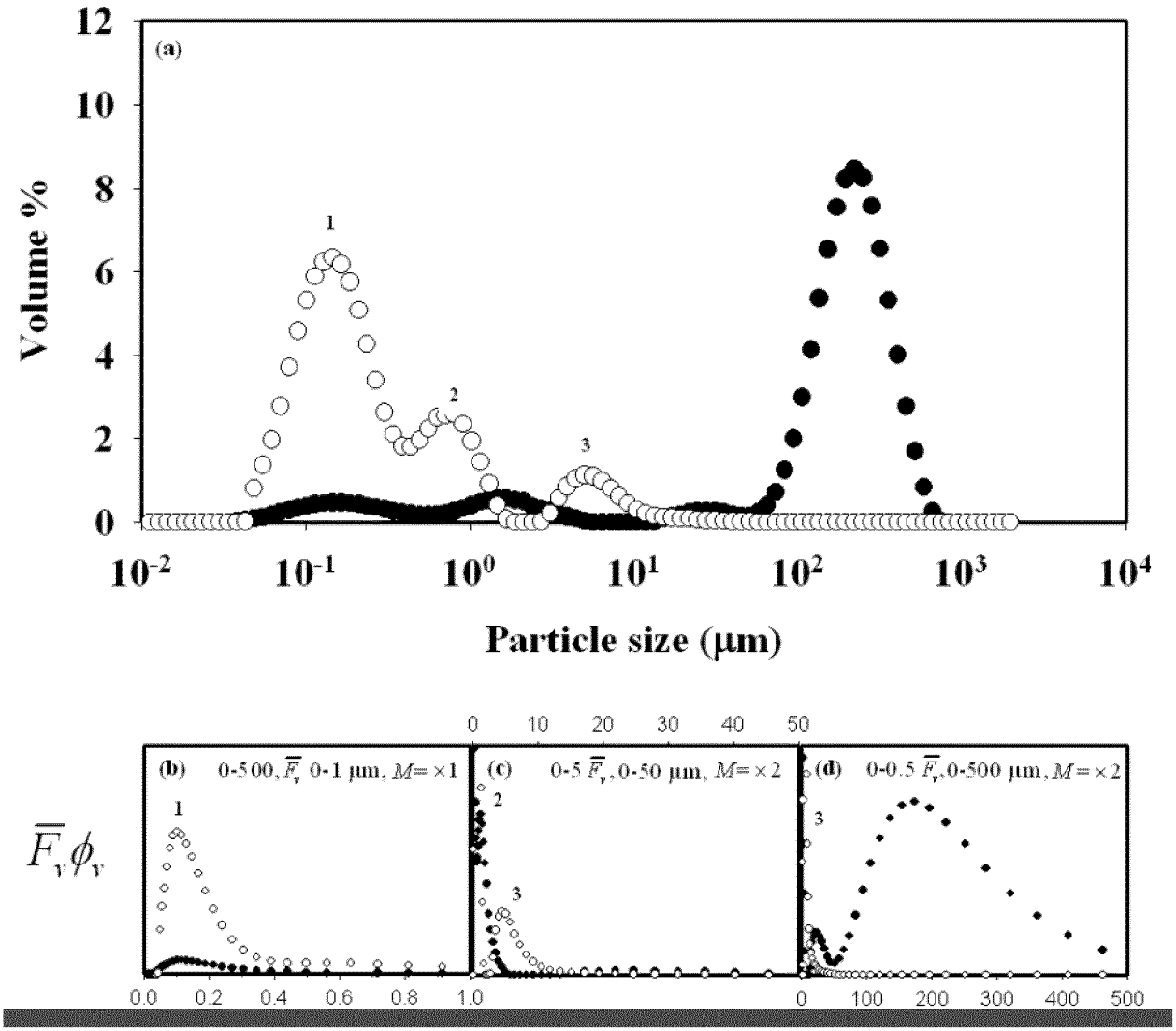

(a)
Volume %
Particle size (μm)
(b) 0-500, $\overline{F}_v$ 0-1 μm, M=×1
(c) 0-5 $\overline{F}_v$, 0-50 μm, M=×2
(d) 0-0.5 $\overline{F}_v$, 0-500 μm, M=×2
$\overline{F}_v\phi_v$

Figure 15

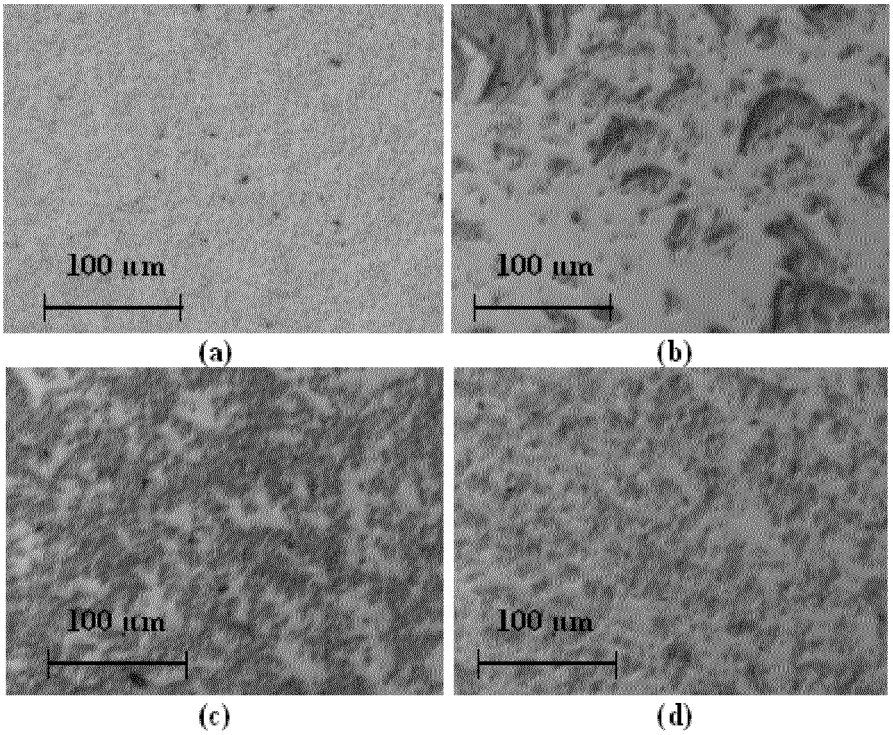


Figure 16

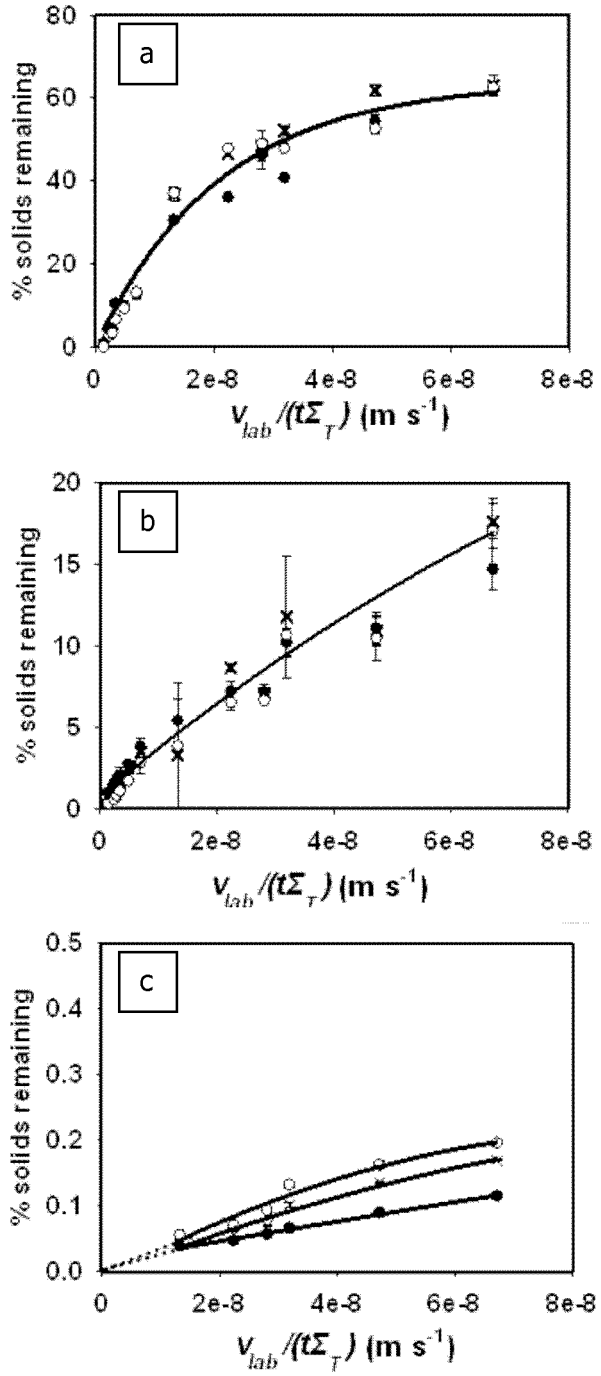
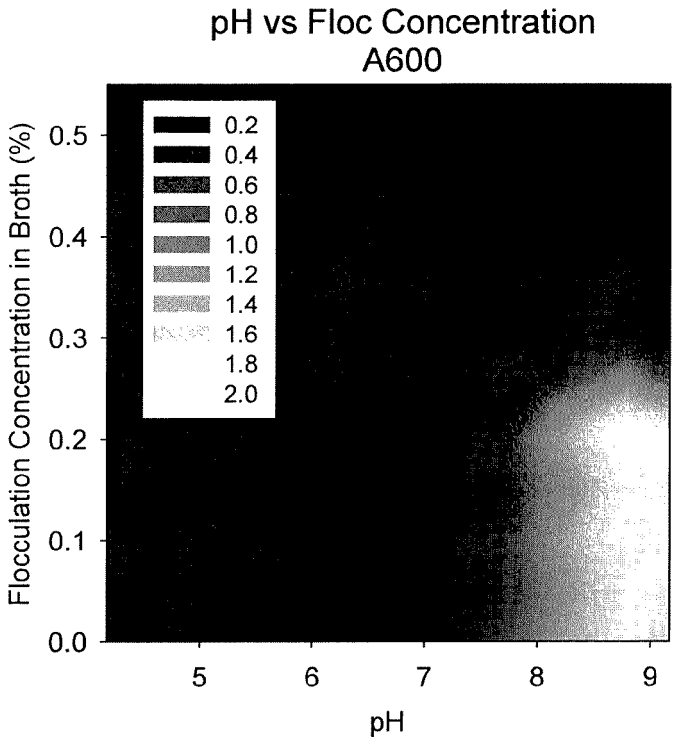

a
% solids remaining
80
60
40
20
0
0
2e-8
4e-8
6e-8
8e-8
$V_{lab}/(t\Sigma_T)$ (m s^{-1})
b
% solids remaining
20
15
10
5
0
0
2e-8
4e-8
6e-8
8e-8
$V_{lab}/(t\Sigma_T)$ (m s^{-1})
c
% solids remaining
0.5
0.4
0.3
0.2
0.1
0.0
0
2e-8
4e-8
6e-8
8e-8
$V_{lab}/(t\Sigma_T)$ (m s^{-1})

Figure 17

A


pH vs Floc Concentration
A600
Flocculation Concentration in Broth (%)
0.0
0.1
0.2
0.3
0.4
0.5
0.2
0.4
0.6
0.8
1.0
1.2
1.4
1.6
1.8
2.0
5
6
7
8
9
pH

B

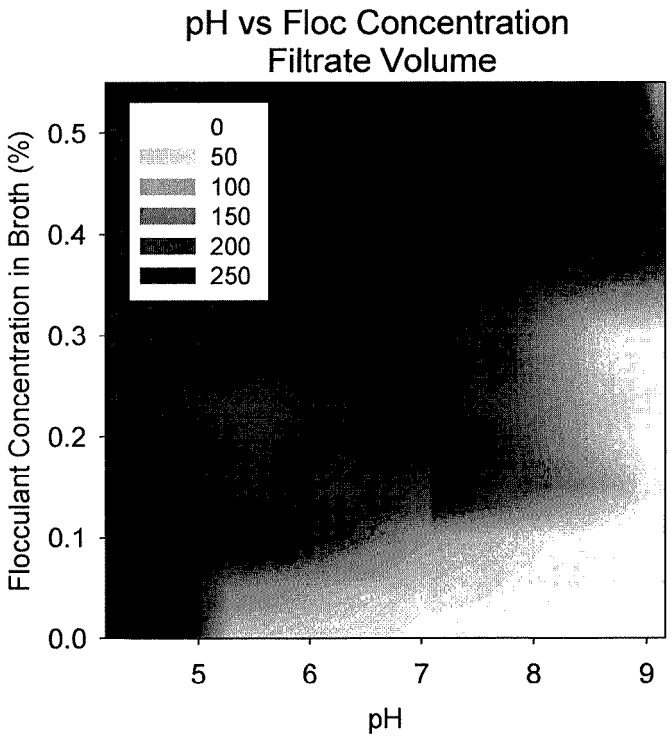
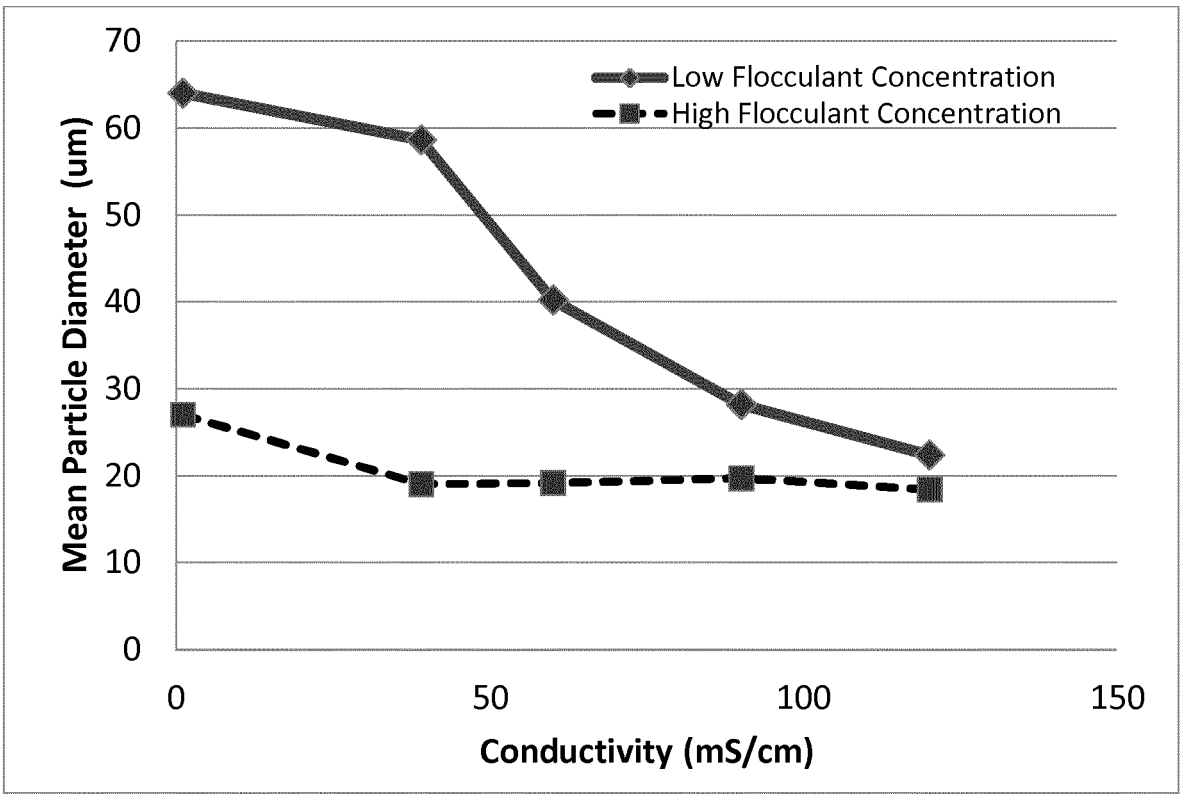

pH vs Floc Concentration
Filtrate Volume
Flocculant Concentration in Broth (%)
0.0
0.1
0.2
0.3
0.4
0.5
0
50
100
150
200
250
5
6
7
8
9
pH

Figure 18

A


70
60
50
40
30
20
10
0
Mean Particle Diameter (um)
Low Flocculant Concentration
High Flocculant Concentration
0
50
100
150
Conductivity (mS/cm)

B

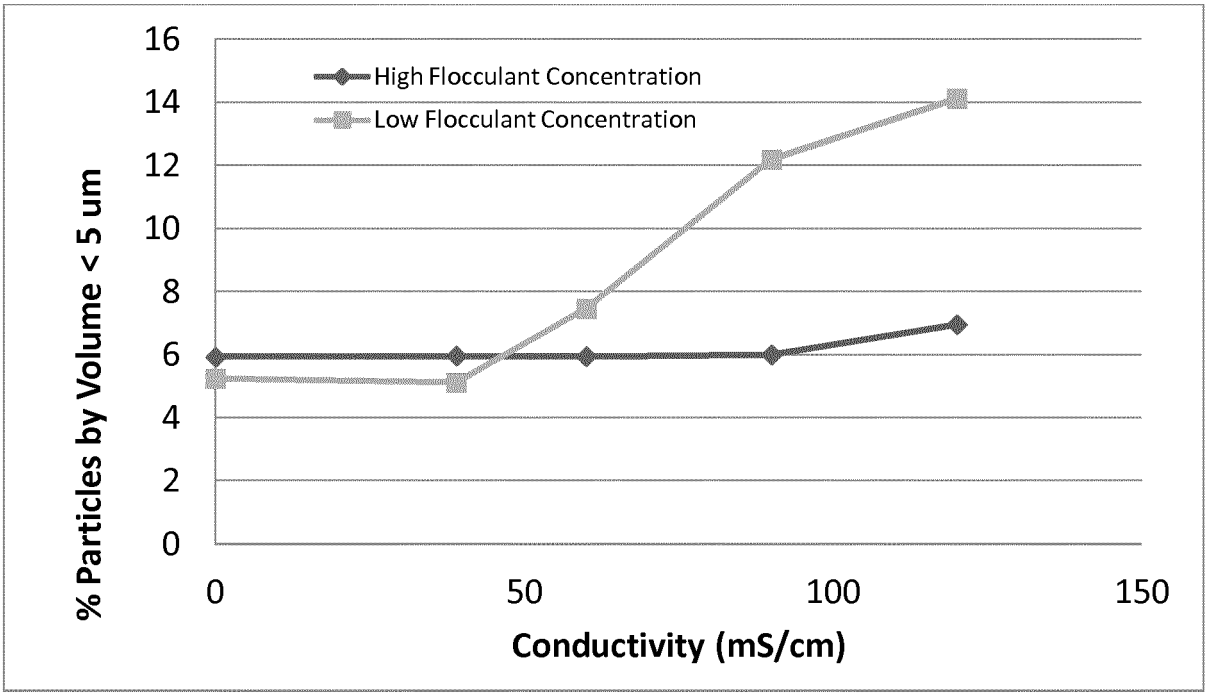
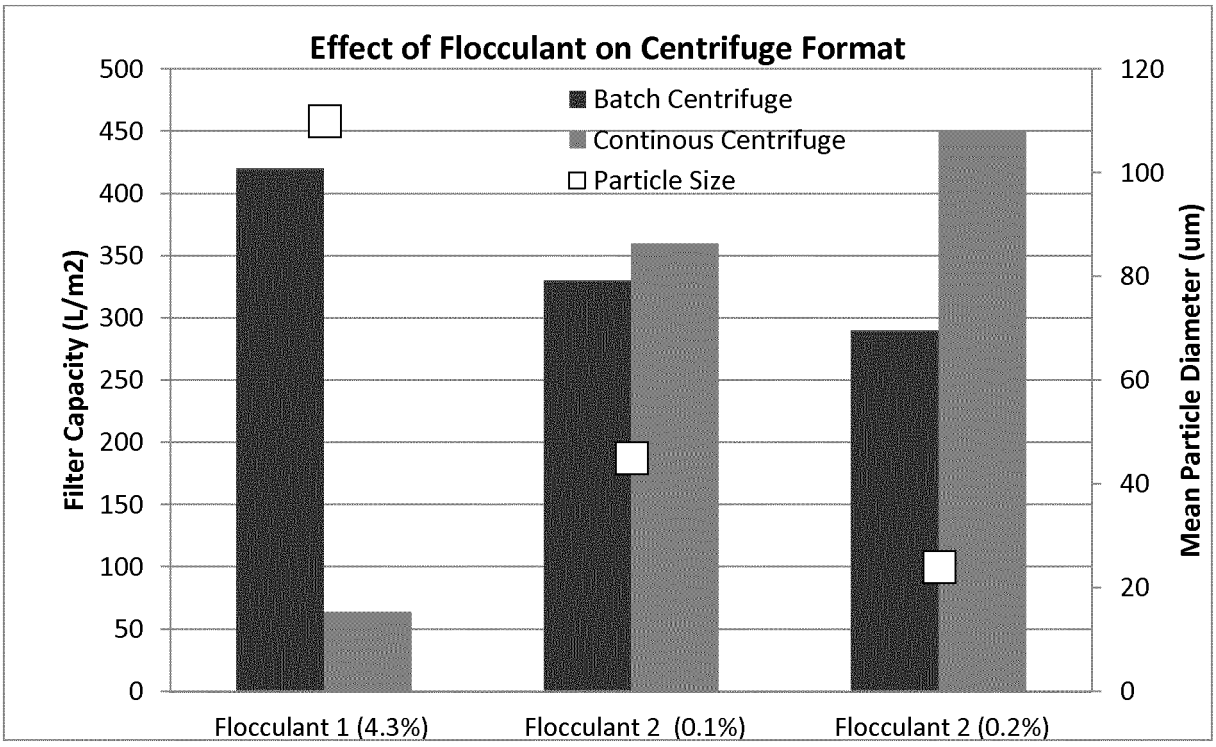

16
14
12
10
8
6
4
2
0
% Particles by Volume < 5 um
High Flocculant Concentration
Low Flocculant Concentration
0
50
100
150
Conductivity (mS/cm)

Figure 19

A


Effect of Flocculant on Centrifuge Format
Batch Centrifuge
Continous Centrifuge
Particle Size
Filter Capacity (L/m2)
Mean Particle Diameter (um)
500
450
400
350
300
250
200
150
100
50
0
120
100
80
60
40
20
0
Flocculant 1 (4.3%)
Flocculant 2 (0.1%)
Flocculant 2 (0.2%)

B

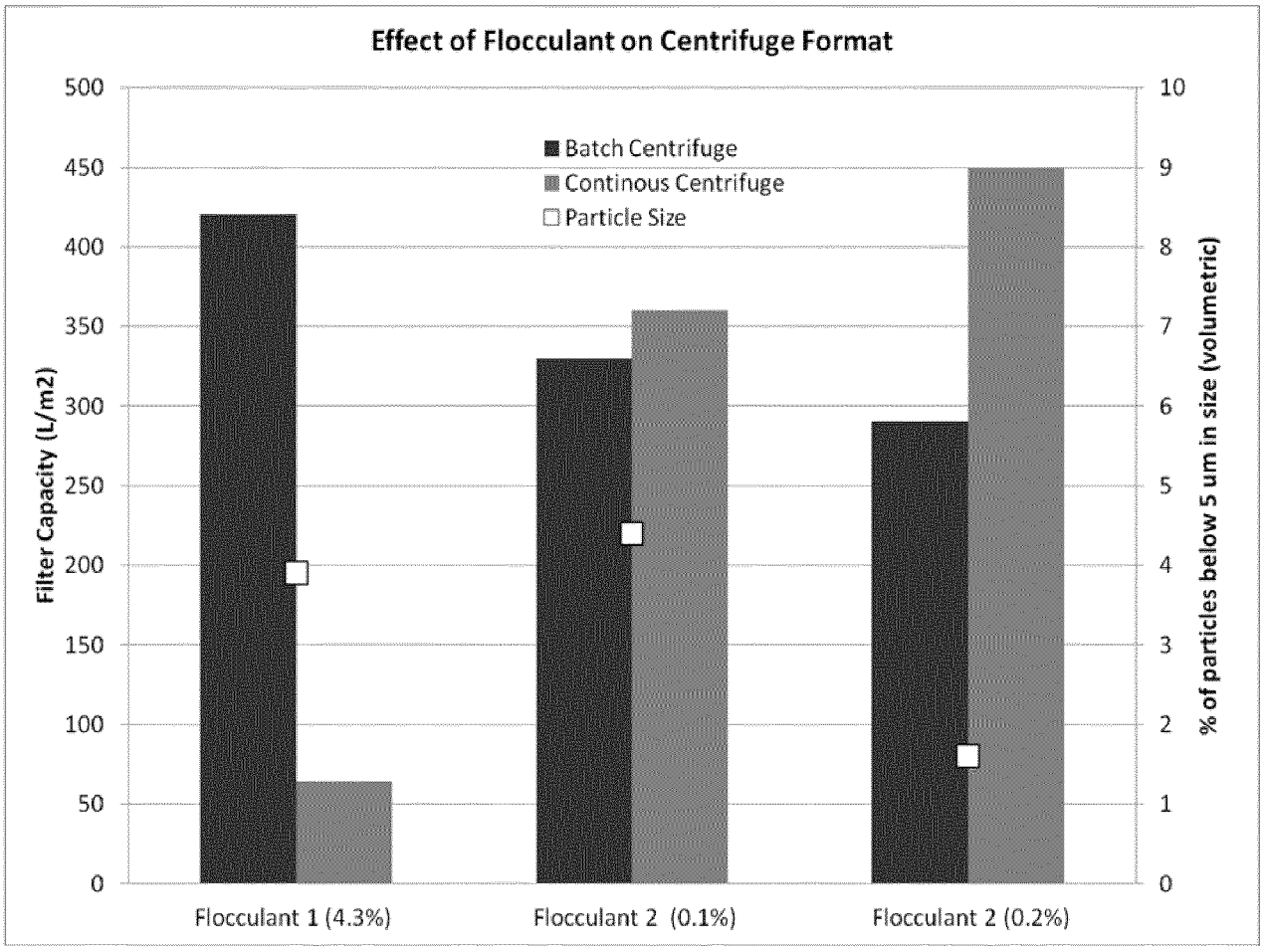
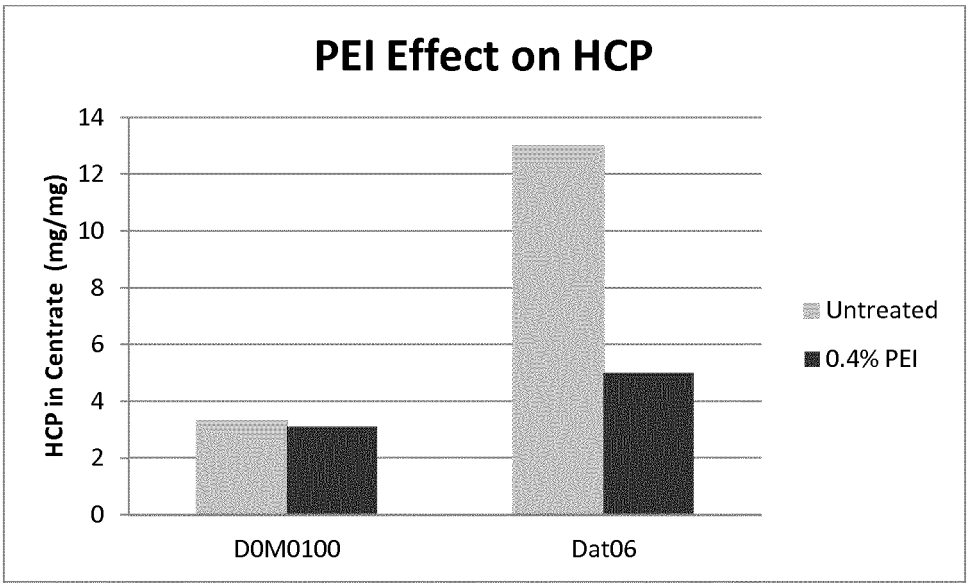

Effect of Flocculant on Centrifuge Format
Batch Centrifuge
Continous Centrifuge
Particle Size
Filter Capacity (L/m2)
% of particles below 5 um in size (volumetric)
500
450
400
350
300
250
200
150
100
50
0
10
9
8
7
6
5
4
3
2
1
0
Flocculant 1 (4.3%)
Flocculant 2 (0.1%)
Flocculant 2 (0.2%)

Figure 20


PEI Effect on HCP
HCP in Centrate (mg/mg)
14
12
10
8
6
4
2
0
D0M0100
Dat06
Untreated
0.4% PEI