Figure Captions

Fig.1 (A) The visual appearance of various 0.5% (w/v) soy protein dispersions at pH 7.5. SPI and SSPI refer to intact and ultrasonicated soy protein isolate. SSPI digested by trypsin and alcalase at different levels of hydrolysis (i.e. 2.5%, 5.5% and 8.0%) are denoted as SST1, SST2, SST3 and SSA1, SSA2, SSA3, respectively. The average protein particle size of SSPI and its hydrolysates post digestion by trypsin and alcalase are presented in (B) and (C), respectively.

Fig.2 Reducing SDS-PAGE analysis of the protein/peptide profiles for various soy protein samples. Lane 0 is ultrasonicated SPI. Lane 1-3 are polypeptides produced by trypsin digestion at lower to higher DH (i.e. SST1, SST2 and SST3, respectively). Lane 4-6 are polypeptides produced by alcalase digestion at lower to higher DH (i.e. SSA1, SSA2 and SSA3, respectively). Lane M is the molecular weight ladder. A sample post conjugation with maltodextrin (i.e. SST3-MD) is also shown at lane 8 to be compared with its unconjugated counterpart (i.e. SST3) at lane 7.

Fig.3 (A) Solubility of SPI, ultrasonicated SPI (i.e. SSPI), and SSPHs samples hydrolysed by trypsin or alcalase at various levels of hydrolysis, plotted as a function of pH. (B) The visual appearance of 1% (w/v) SST3 sample, dispersed under various pH conditions.

Fig.4 (A) Solubility of conjugates made from ultrasonicated SPI (i.e. SSPI-MD), and those from fragmented soy protein produced by either trypsin or alcalase (i.e. SST1-MD, SST2-MD, SST3-MD and SSA1-MD, SSA2-MD, SSA3-MD samples) at various levels of hydrolysis, plotted as a function of pH. (B) The visual appearance of 1% (w/v) SST3-MD sample, dispersed under various pH conditions.

Fig.5 Effects of addition of SDS, DTT, or both to a dispersion of otherwise insoluble MRPs produced from ultrasonicated soy protein + maltodextrin (i.e. sample SSPI-MD). Ultrasonicated soy protein without conjugation (SSPI) was dissolved in deionized water and is included for comparison on the left. SSPI-MD was dissolved in different solvents (from left to right): deionized water, buffer (pH 9.0, 0.086 M Tris, 0.09 M Glycine), 5% SDS + buffer, 0.5 M DTT + buffer, 5% SDS + 0.5 M DTT + buffer.

Fig.6 Average droplet size of emulsions, fabricated using intact and hydrolysed soy proteins (A) and whey proteins (B), shown on day 1 and after 60 days, stored at various pH conditions (pH 7.5, 4.5 and 3.0).

Fig.7 Micrographs of SST3 (A) and WT1 (B) fabricated emulsions, stored at pH 7.5 and 4.5, on day 1 and after 60 days of storage. The label on the top left of each photo indicates the emulsifier - storage pH - storage time (days). The letters S and W indicate emulsions produced with SST3 (trypsin hydrolysed SPI at DH 8.0%) and those with WT1 (trypsin hydrolysed WPI at DH 2.5%), respectively. The droplet size distribution and the mean droplet size $D_{4,3}$ are also provided on each of the photos.

Fig.8 Average droplet size of emulsions, fabricated using conjugates made from SSPHs + maltodextrin (A) and WPI/WPHs + maltodextrin (B), shown on day 1 and after 60 days, stored at various pH conditions (pH 7.5, 4.5 and 3.0). The scales in both sets of bar graphs are kept the same for the ease of comparison. However, a more detailed version of (B) is also shown in the inset.

Fig.9 Micrographs of emulsions produced using SST3-MD (A) and WT1-MD (B) as the emulsifier, stored at pH 7.5 and 4.5 on day 1 and following 60 days of storage. The label on the top left of each photo indicates the emulsifier - storage pH - storage time (days). The letters CS and CW indicate the emulsions made with conjugated SST3 and those with conjugated WT1, respectively. The droplet size distribution and the mean droplet size $D_{4,3}$ are also shown, superimposed on each micrograph.

Fig.10 Micrographs of freshly made emulsions produced using SST3-MD conjugates as emulsifiers, after adjustment of pH to 3.0 (A), then to 2.0 (B) and finally back up to pH 7.5 (C). The samples were kept at the intermediate pH for only a few minutes. The droplet size distribution and the mean droplet size $D_{4,3}$ are also shown, superimposed on each micrograph.

Fig.1

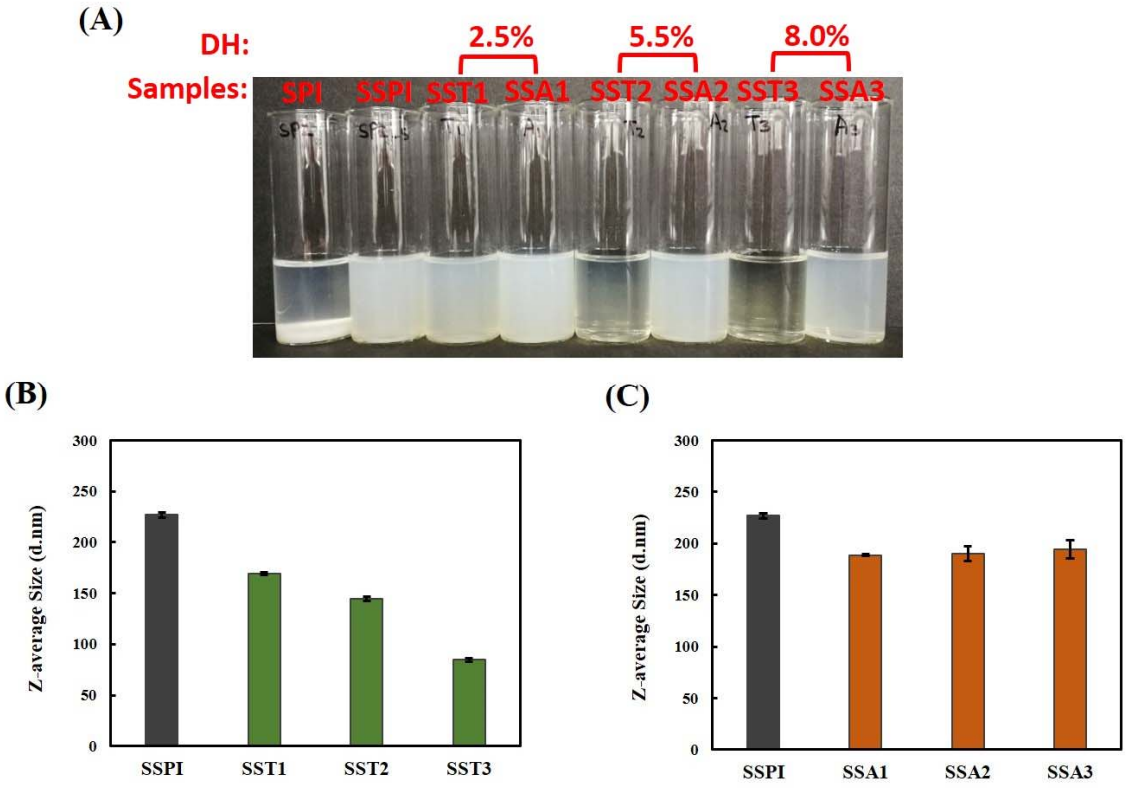

(A)
DH:
2.5%
5.5%
8.0%
Samples:
SPI
SSPI
SST1
SSA1
SST2
SSA2
SST3
SSA3
(B)
Z-average Size (d.nm)
300
250
200
150
100
50
0
SSPI
SST1
SST2
SST3
(C)
Z-average Size (d.nm)
300
250
200
150
100
50
0
SSPI
SSA1
SSA2
SSA3

Fig.2

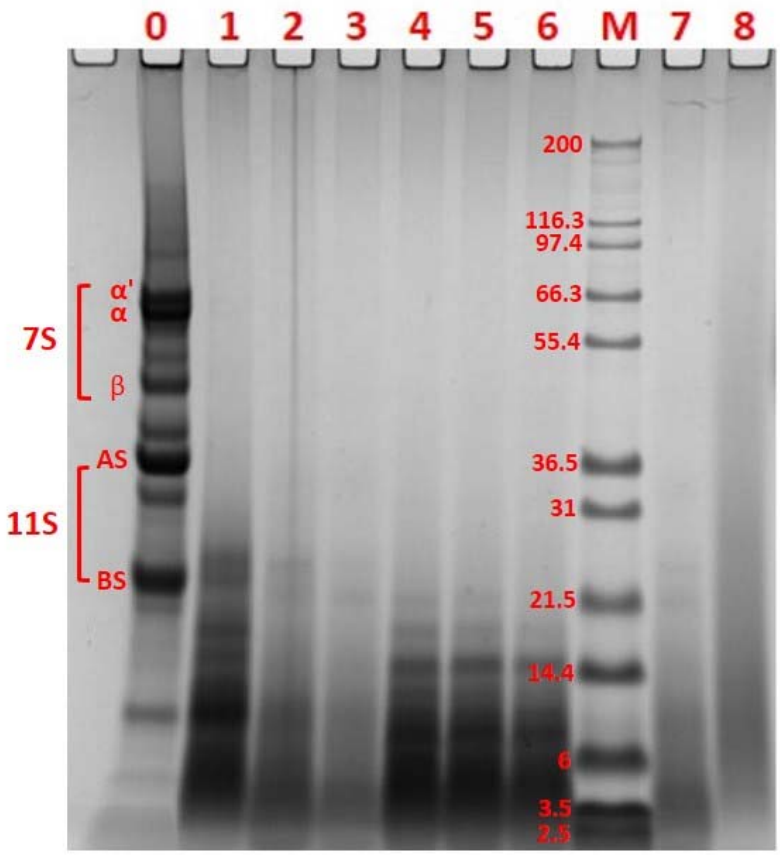

0
1
2
3
4
5
6
M
7
8
200
116.3
97.4
66.3
55.4
36.5
31
21.5
14.4
6
3.5
2.5
α'
α
β
7S
AS
BS
11S

Fig.3

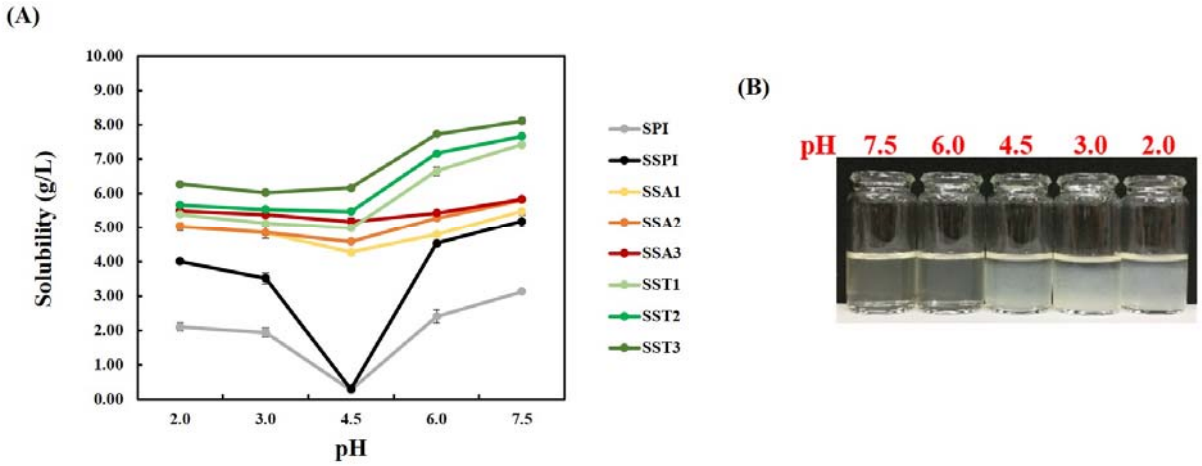

(A)
Solubility (g/L)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
2.0
3.0
4.5
6.0
7.5
pH
SPI
SSPI
SSA1
SSA2
SSA3
SST1
SST2
SST3
(B)
pH 7.5 6.0 4.5 3.0 2.0

Fig.4

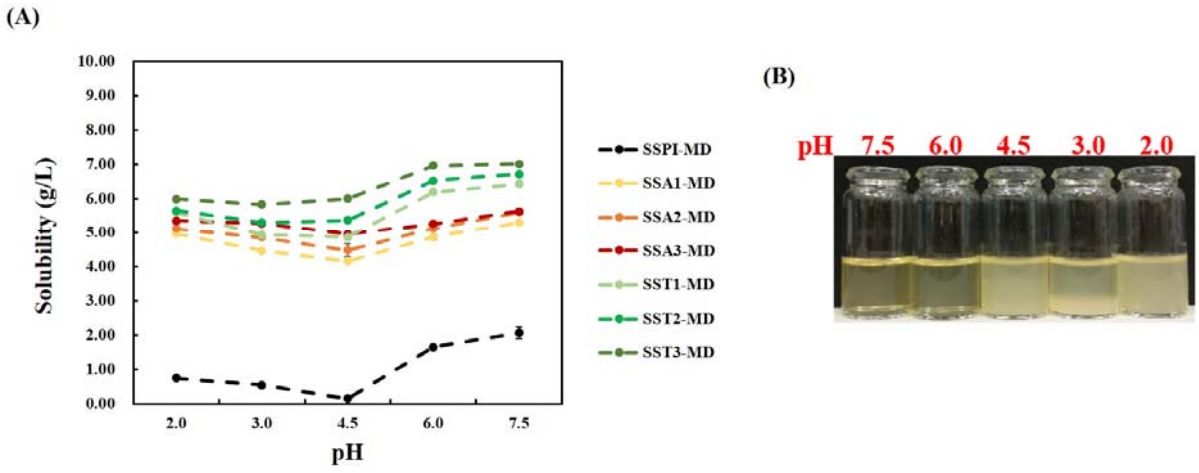

(A)
Solubility (g/L)
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
2.0
3.0
4.5
6.0
7.5
pH
SSPI-MD
SSA1-MD
SSA2-MD
SSA3-MD
SST1-MD
SST2-MD
SST3-MD
(B)
pH 7.5 6.0 4.5 3.0 2.0

Fig.5

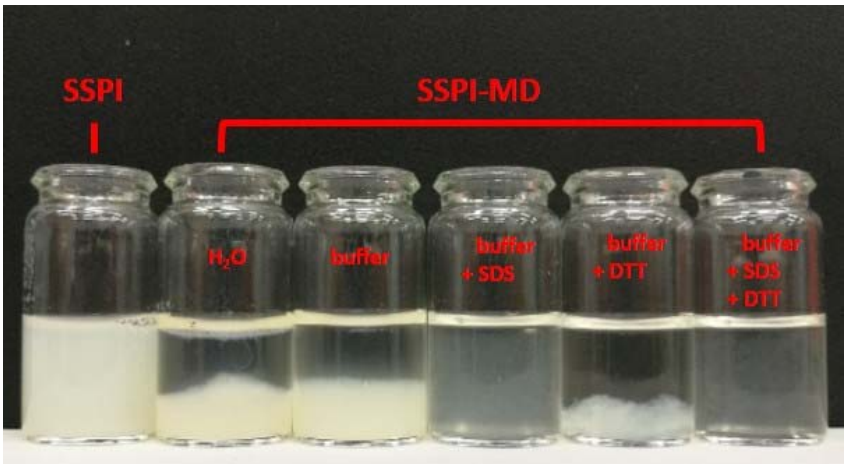


Fig.6

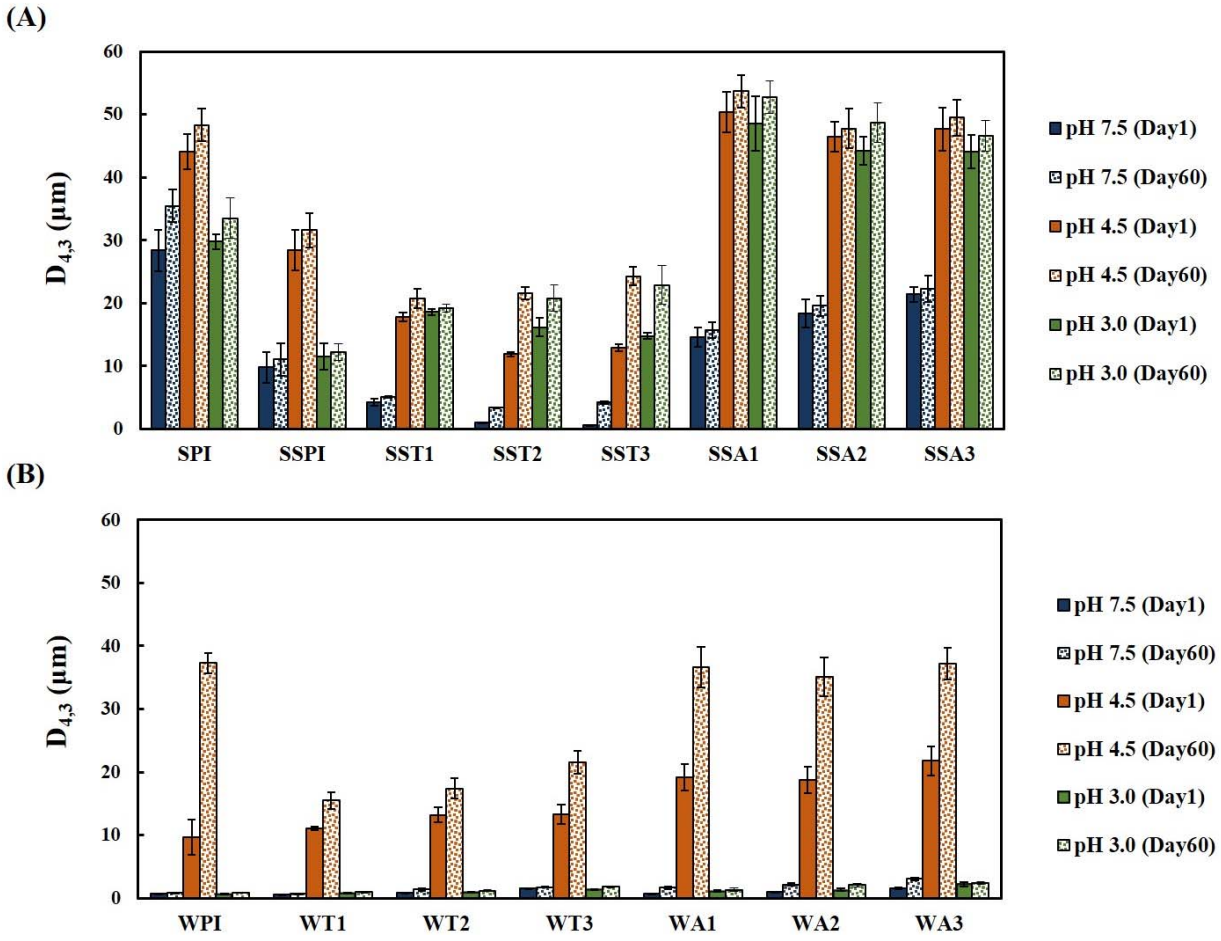

(A)
$D_{4,3}$ (μm)
60
50
40
30
20
10
0
SPI
SSPI
SST1
SST2
SST3
SSA1
SSA2
SSA3
pH 7.5 (Day1)
pH 7.5 (Day60)
pH 4.5 (Day1)
pH 4.5 (Day60)
pH 3.0 (Day1)
pH 3.0 (Day60)
(B)
$D_{4,3}$ (μm)
60
50
40
30
20
10
0
WPI
WT1
WT2
WT3
WA1
WA2
WA3
pH 7.5 (Day1)
pH 7.5 (Day60)
pH 4.5 (Day1)
pH 4.5 (Day60)
pH 3.0 (Day1)
pH 3.0 (Day60)

Fig.7

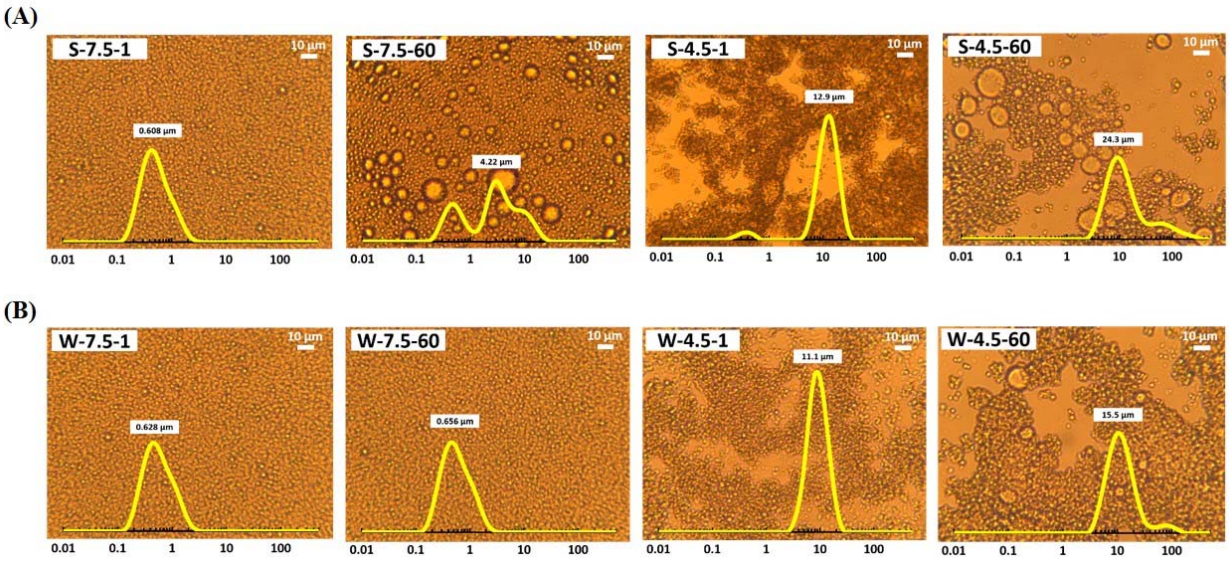

(A)
S-7.5-1
10 µm
0.608 µm
S-7.5-60
10 µm
4.22 µm
S-4.5-1
10 µm
12.9 µm
S-4.5-60
10 µm
24.3 µm
0.01 0.1 1 10 100
(B)
W-7.5-1
10 µm
0.628 µm
W-7.5-60
10 µm
0.656 µm
W-4.5-1
10 µm
11.1 µm
W-4.5-60
10 µm
15.5 µm

Fig.8

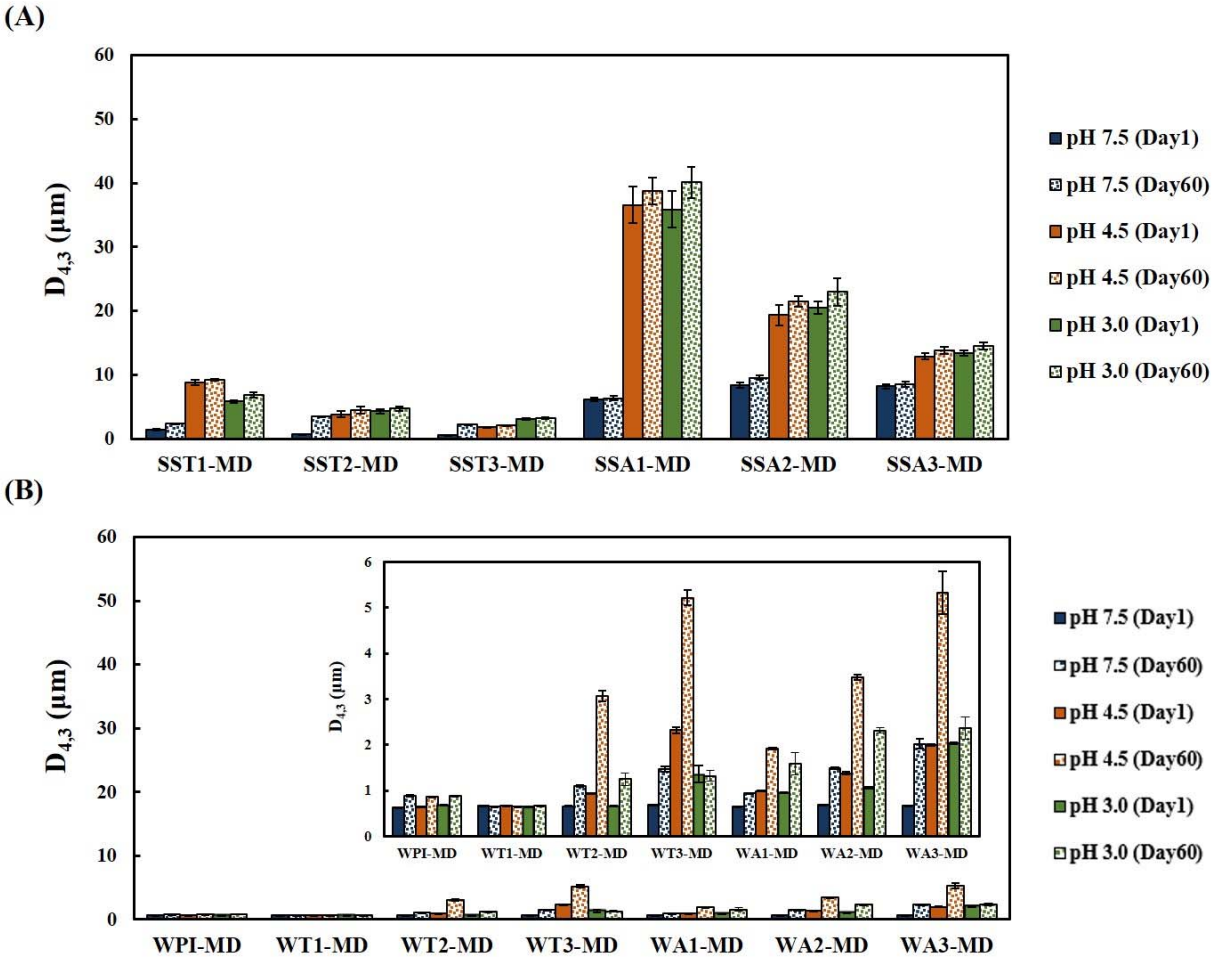

(A)
D4,3 (μm)
60
50
40
30
20
10
0
SST1-MD
SST2-MD
SST3-MD
SSA1-MD
SSA2-MD
SSA3-MD
pH 7.5 (Day1)
pH 7.5 (Day60)
pH 4.5 (Day1)
pH 4.5 (Day60)
pH 3.0 (Day1)
pH 3.0 (Day60)
(B)
D4,3 (μm)
60
50
40
30
20
10
0
WPI-MD
WT1-MD
WT2-MD
WT3-MD
WA1-MD
WA2-MD
WA3-MD
D4,3 (μm)
6
5
4
3
2
1
0
WPI-MD
WT1-MD
WT2-MD
WT3-MD
WA1-MD
WA2-MD
WA3-MD
pH 7.5 (Day1)
pH 7.5 (Day60)
pH 4.5 (Day1)
pH 4.5 (Day60)
pH 3.0 (Day1)
pH 3.0 (Day60)

Fig.9

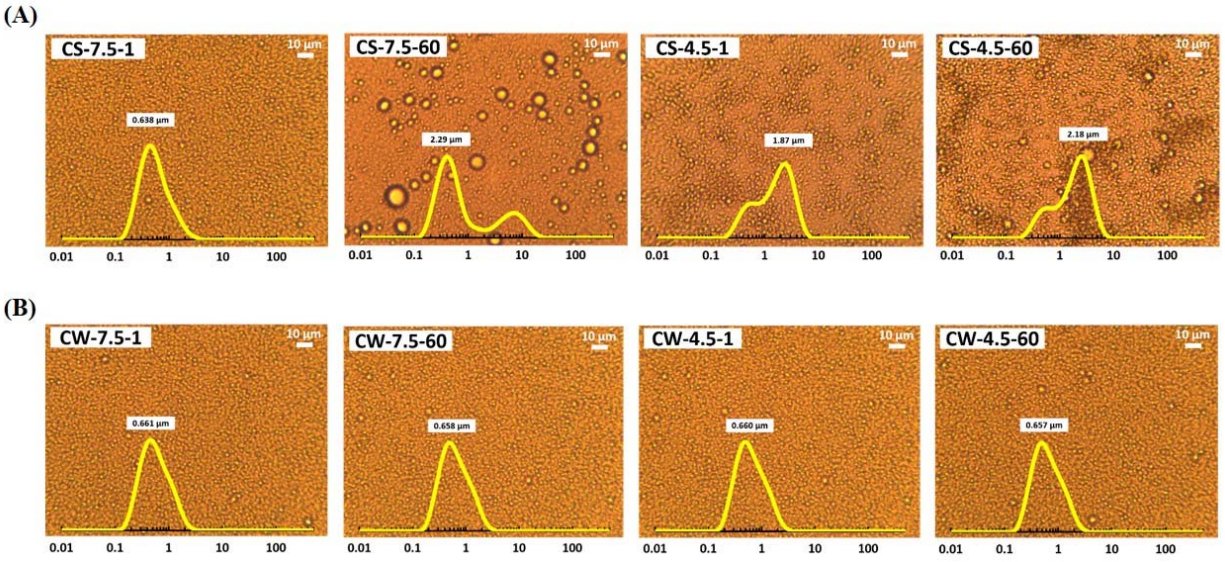
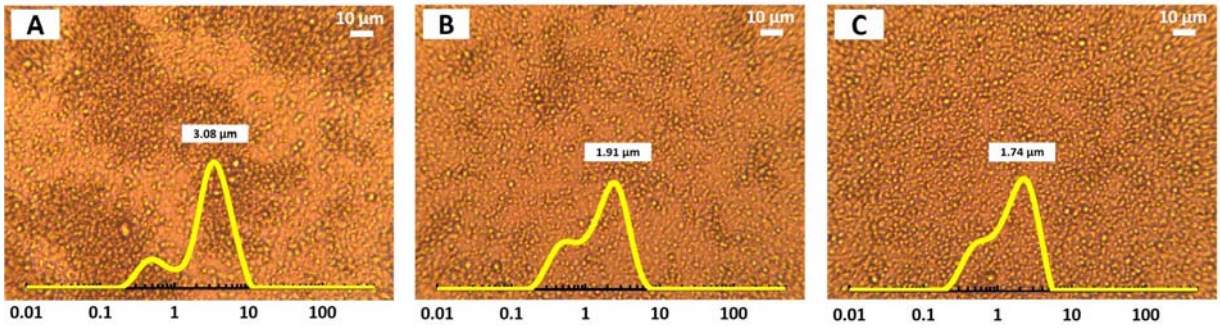

(A)
CS-7.5-1
10 µm
0.638 µm
CS-7.5-60
10 µm
2.29 µm
CS-4.5-1
10 µm
1.87 µm
CS-4.5-60
10 µm
2.18 µm
0.01 0.1 1 10 100
(B)
CW-7.5-1
10 µm
0.661 µm
CW-7.5-60
10 µm
0.658 µm
CW-4.5-1
10 µm
0.660 µm
CW-4.5-60
10 µm
0.657 µm

Fig.10


A
10 µm
3.08 µm
0.01
0.1
1
10
100
B
10 µm
1.91 µm
0.01
0.1
1
10
100
C
10 µm
1.74 µm
0.01
0.1
1
10
100