Supplementary Materials

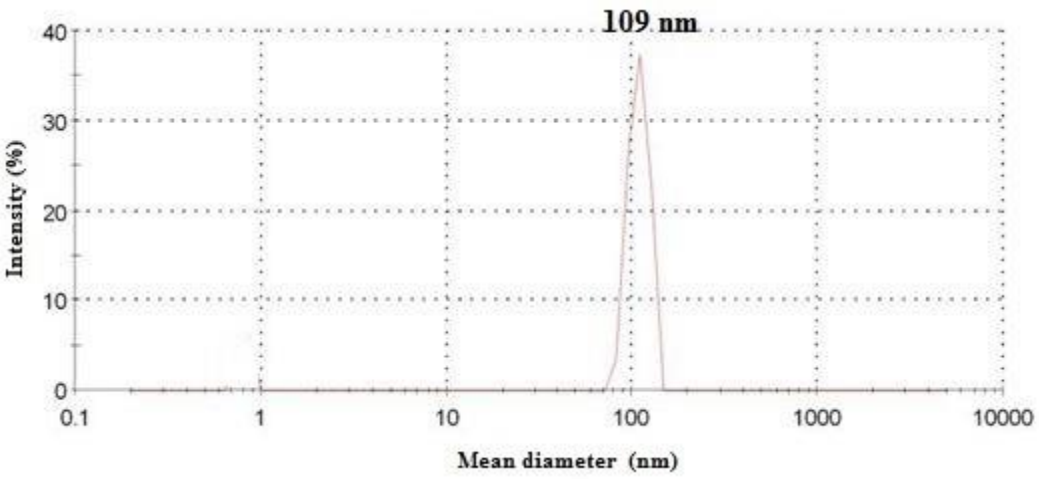
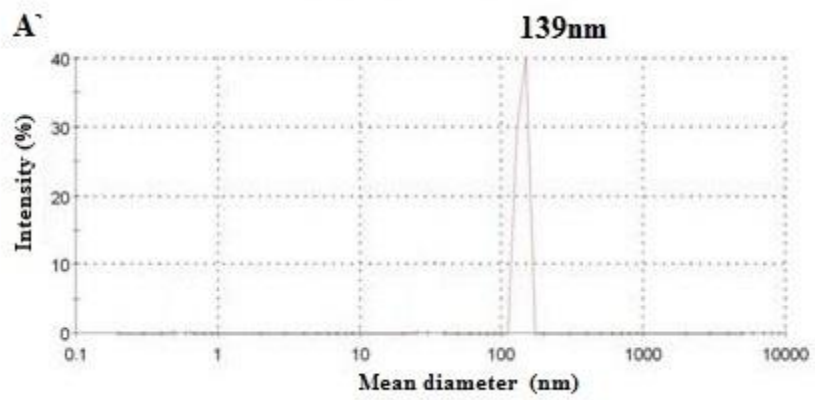
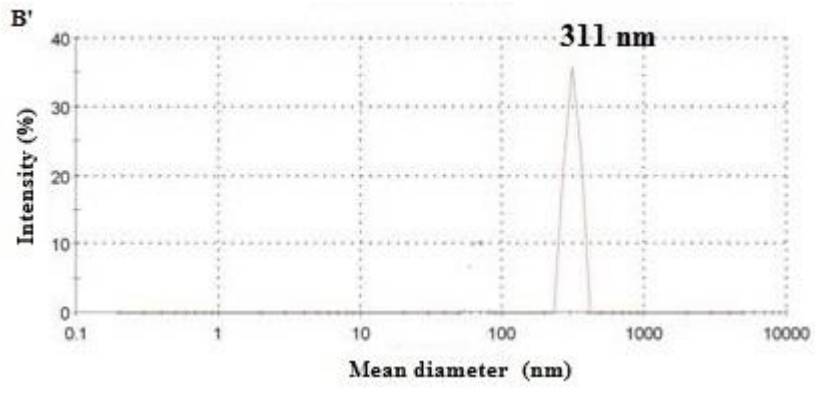


Figure S1. DLS of W/O micro-emulsion of alginate-sol/Hexane/Span 20 representing hydrodynamic diameter of sodium alginate droplet. .





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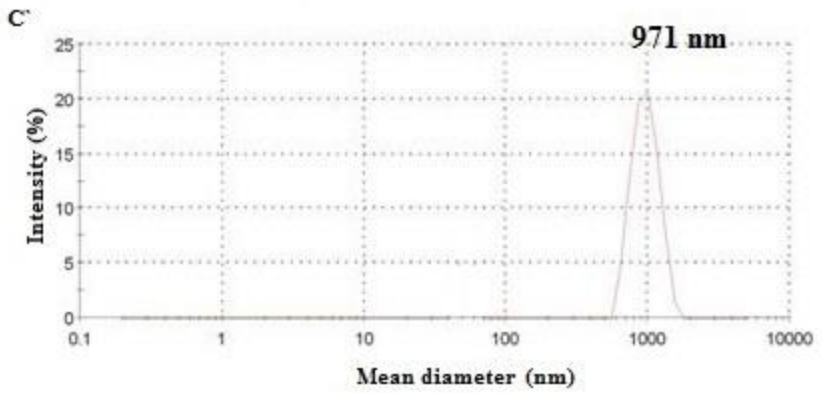
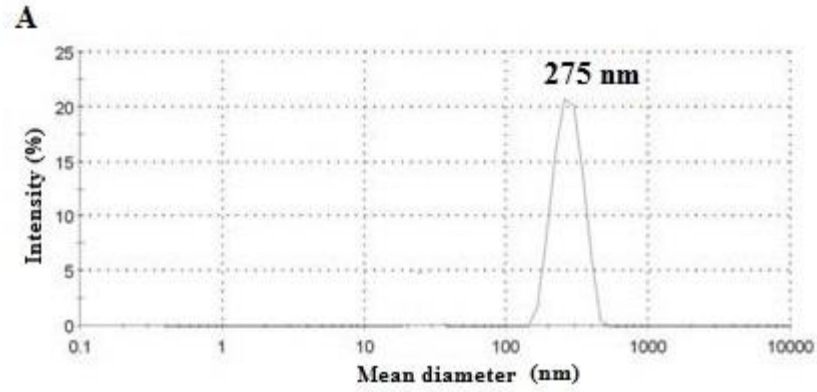
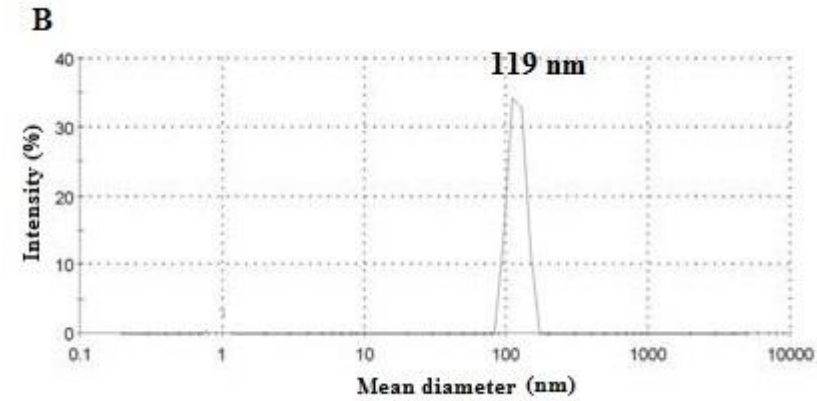


Figure S2. DLS of W/O emulsion of alginate-sol/Hexane/Span 20 representing A`) clear solution; B`) slightly turbid; and C`) milky appearance .





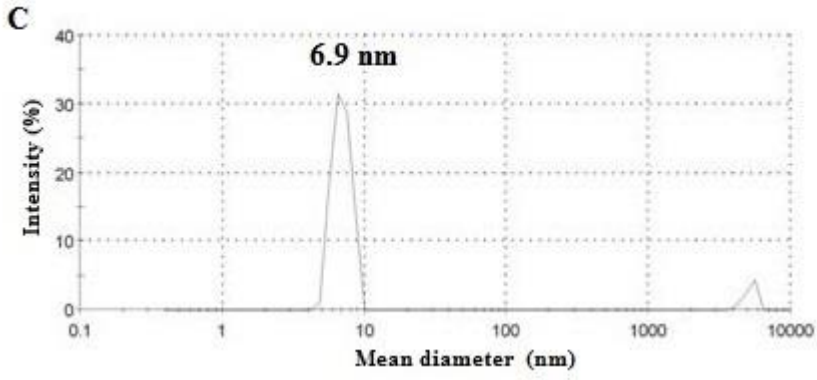
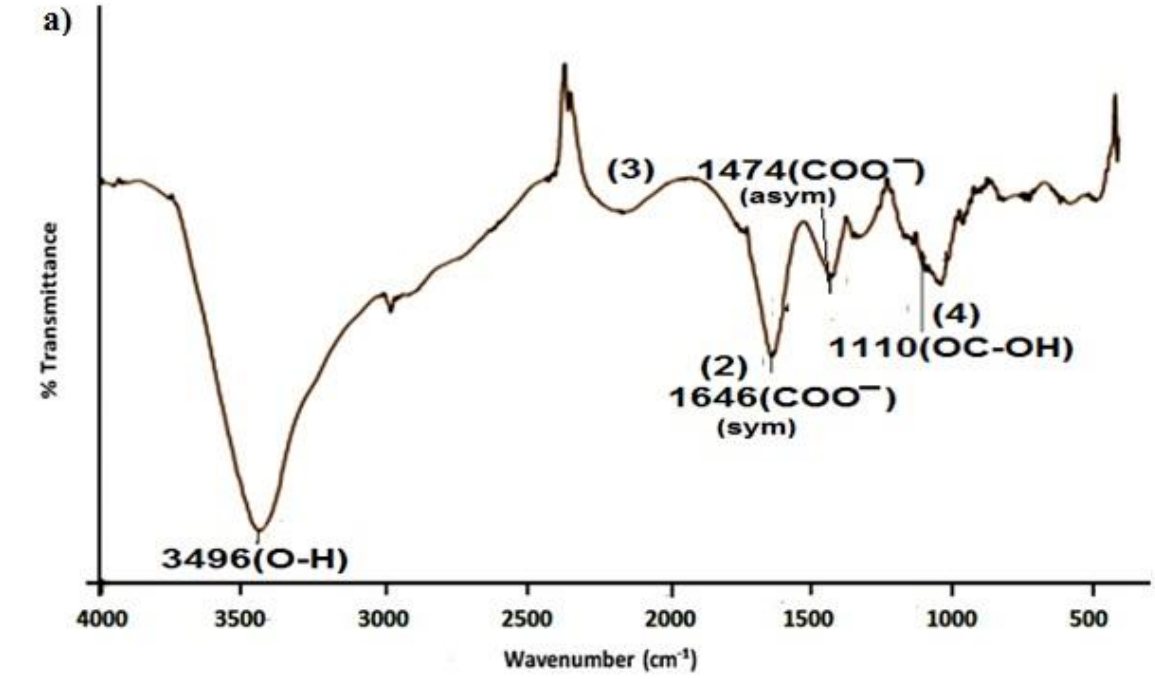
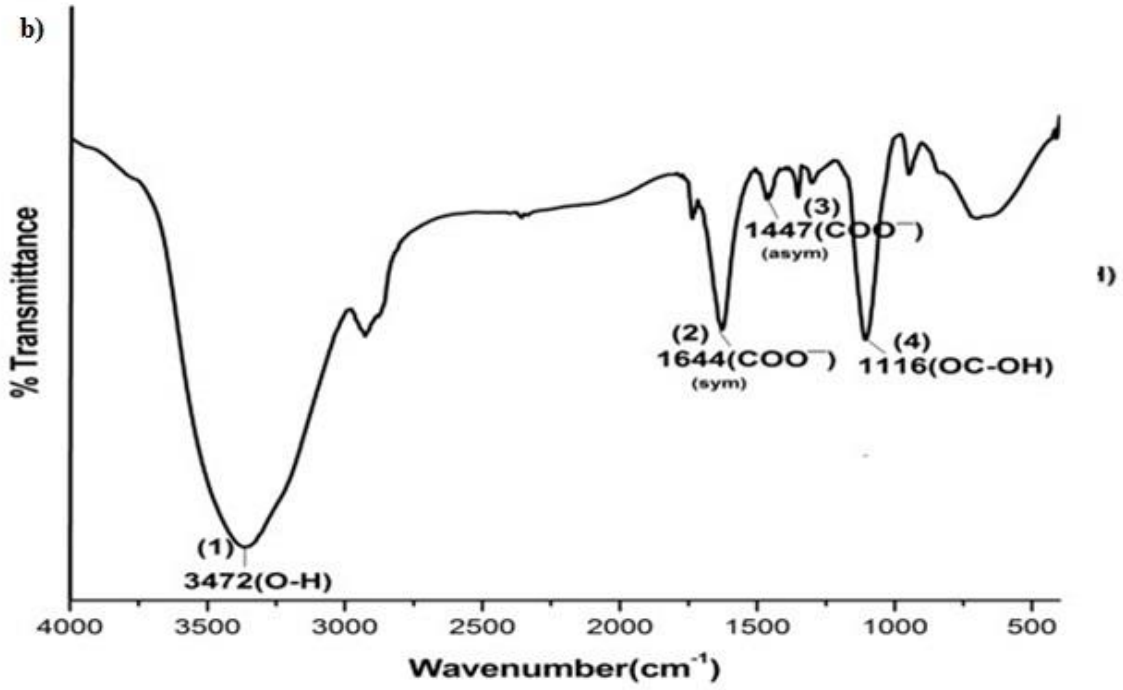


Figure S3. DLS measurement data of: A) Mn-alginate nanogel; B) Fe-alginate nanogel; C) Co-alginate nanogel.





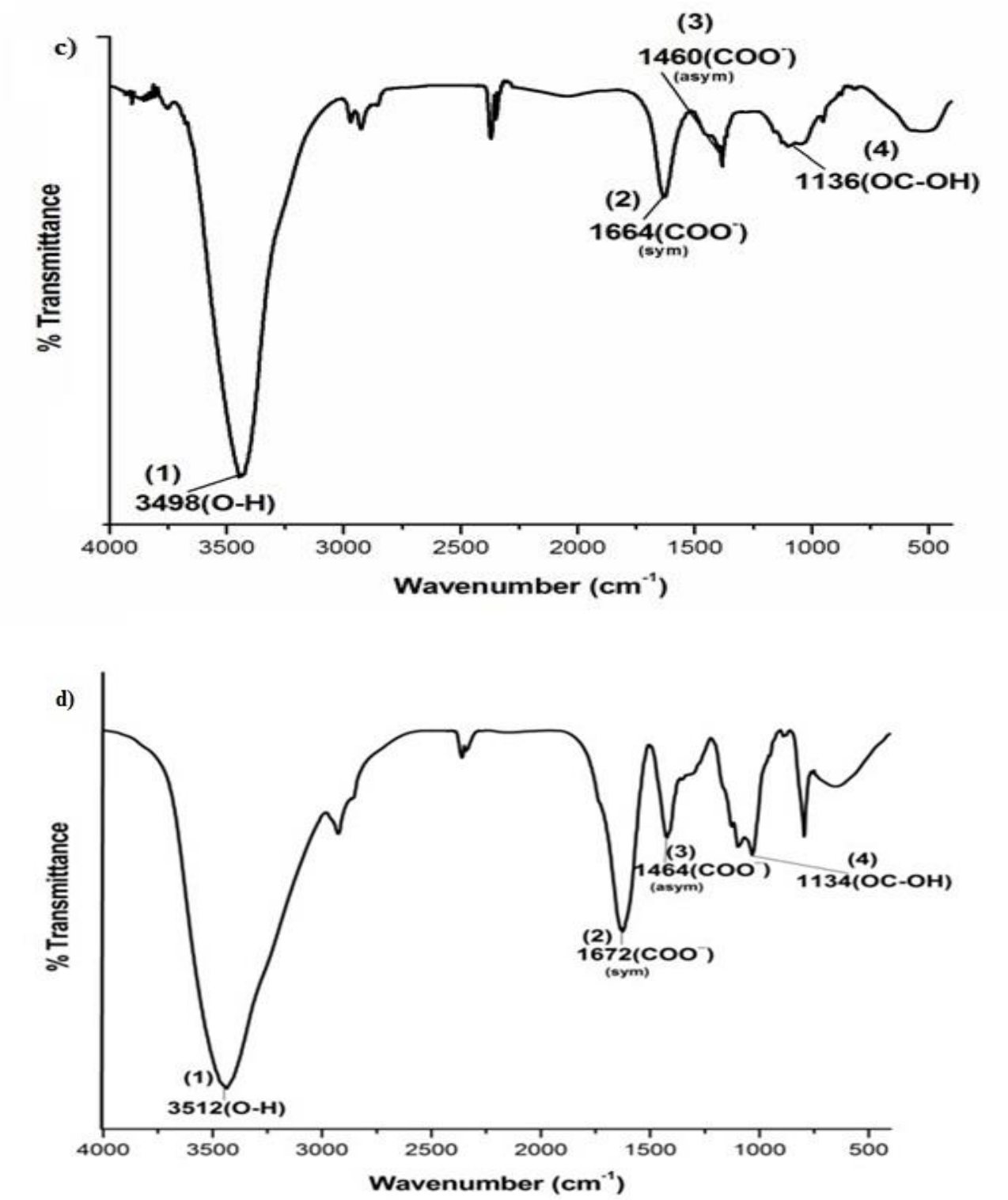
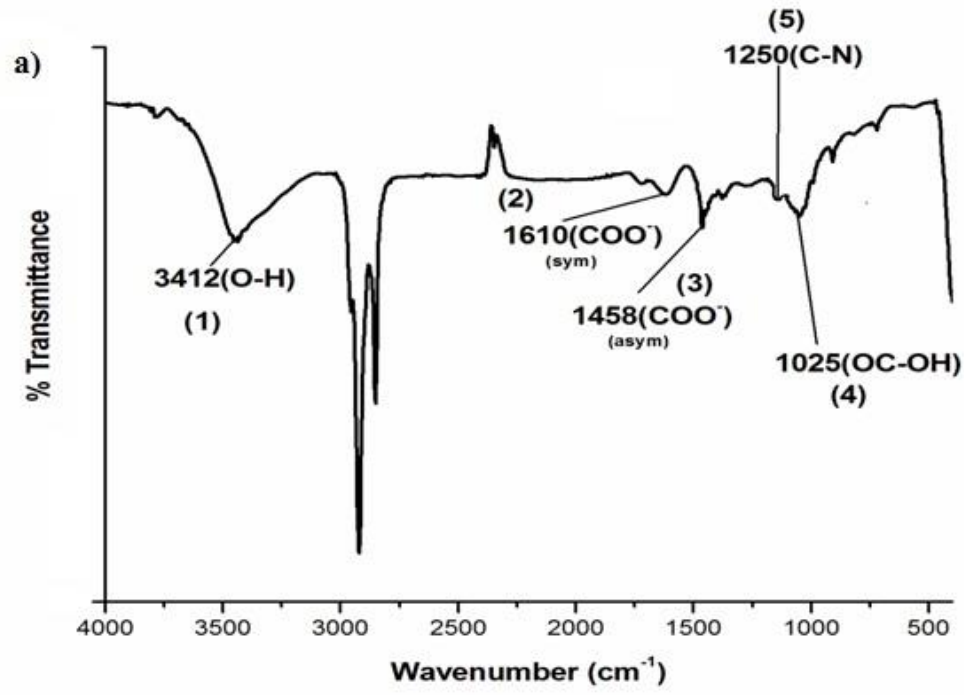
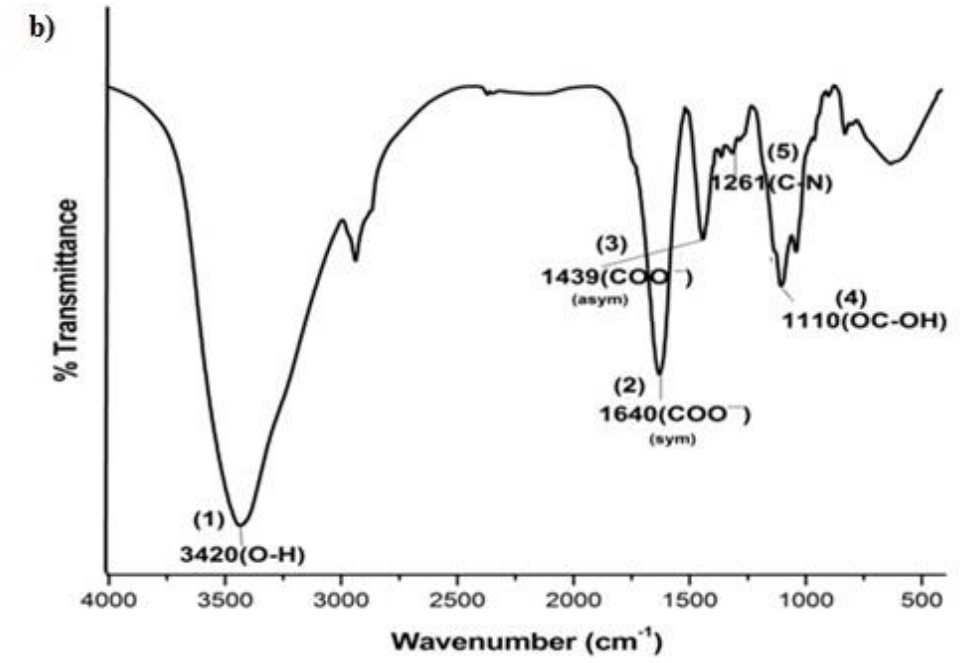
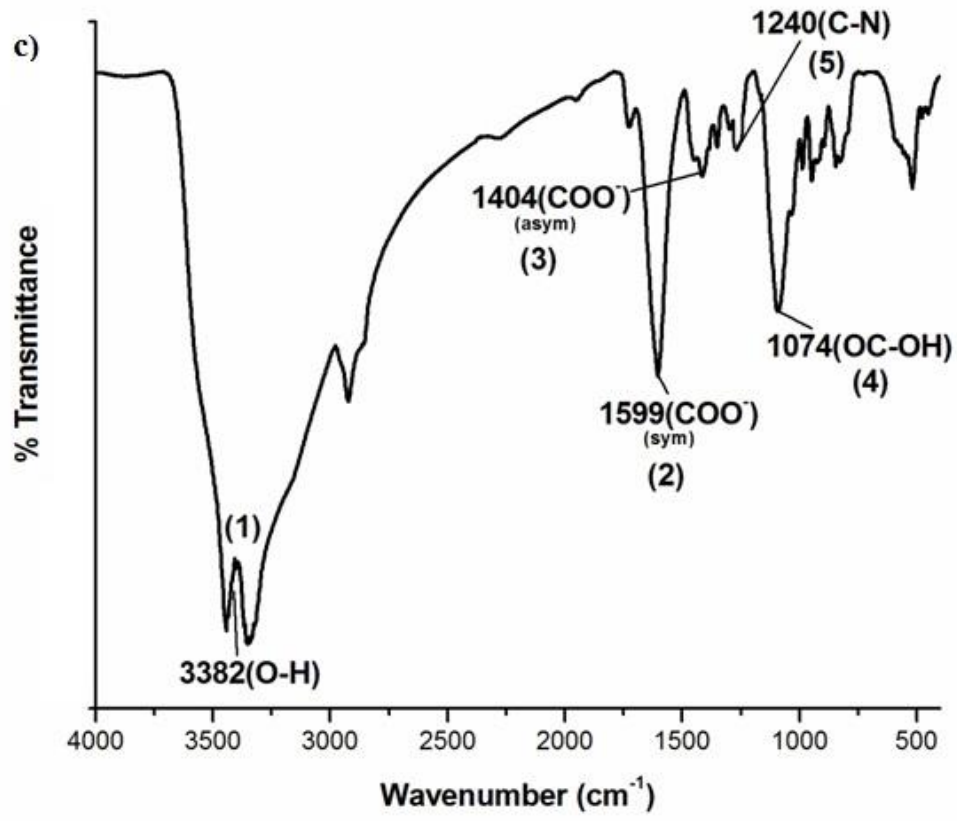


Figure S4. FTIR spectra of (a) alginate salt (sodium alginate) and nanogels cross-linked with: (b)Mn^{+2}, (c) Fe^{+2}, and (d) $Co^{+2.}$


a)
(5)
1250(C-N)
(2)
1610(COO⁻)
(sym)
(3)
1458(COO⁻)
(asym)
3412(O-H)
(1)
1025(OC-OH)
(4)
% Transmittance
4000
3500
3000
2500
2000
1500
1000
500
Wavenumber (cm⁻¹)


b)
(5)
1261(C-N)
(3)
1439(COO⁻)
(asym)
(4)
1110(OC-OH)
(2)
1640(COO⁻)
(sym)
(1)
3420(O-H)
% Transmittance
4000
3500
3000
2500
2000
1500
1000
500
Wavenumber (cm⁻¹)



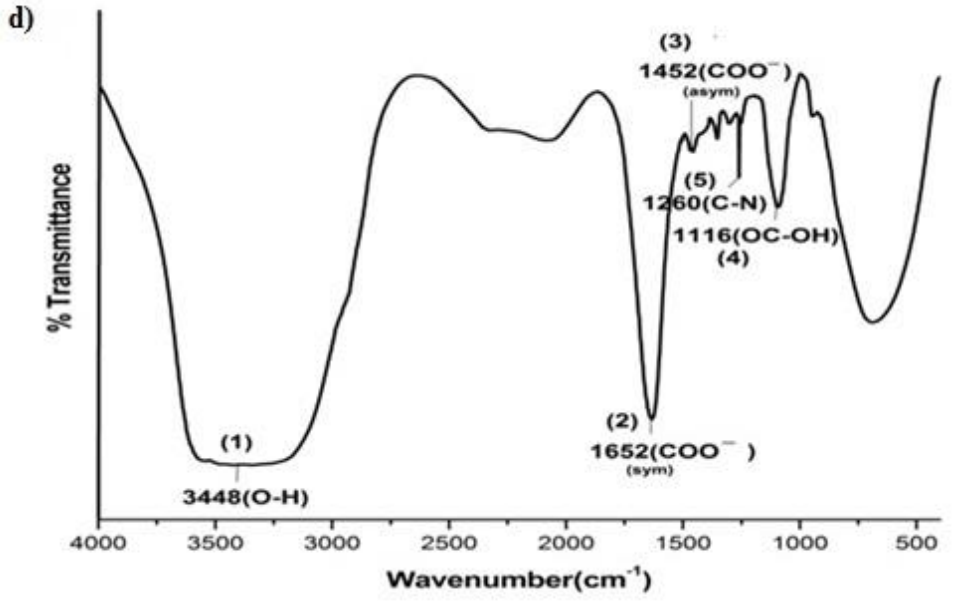
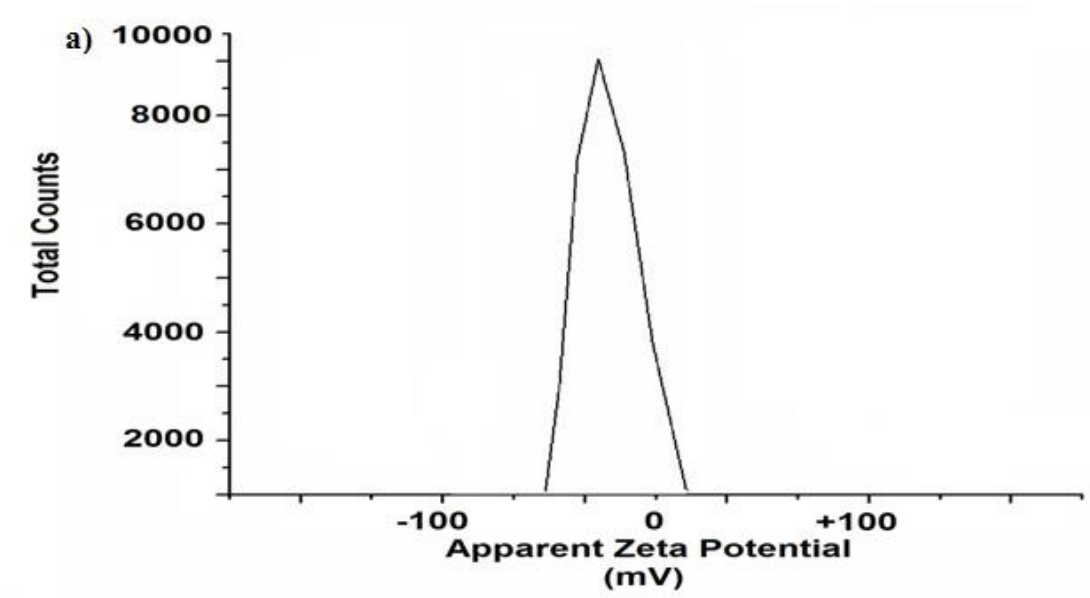
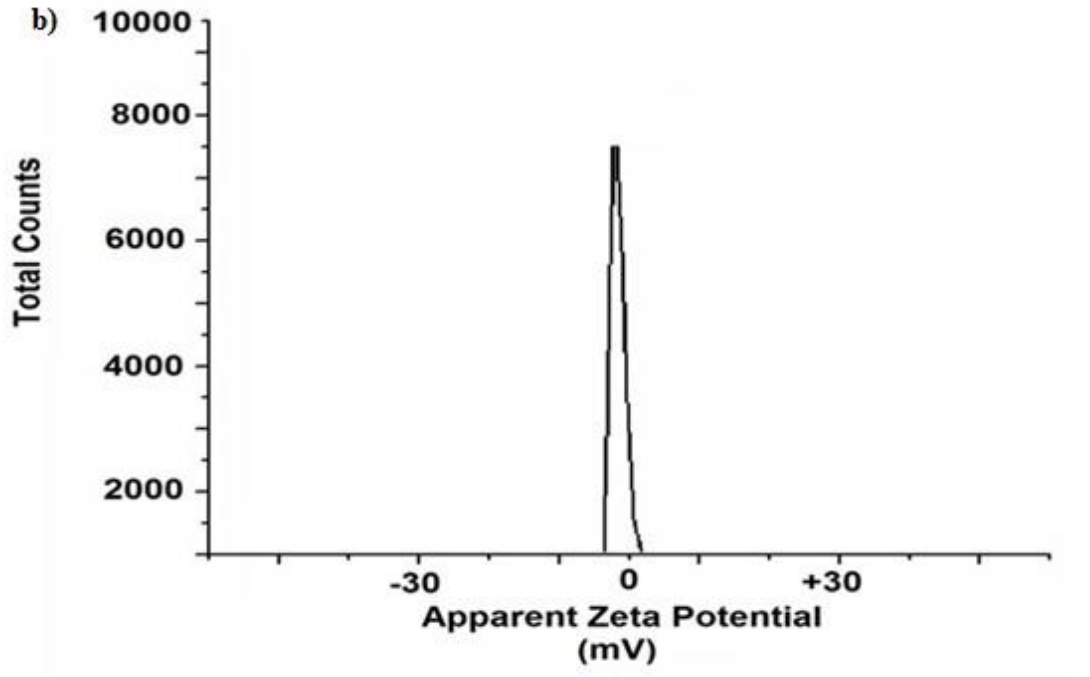


Figure S5. FTIR spectra of (a) urease (lyophilized) and urease encapsulated alginate nanogels formed by cross-linking cations (b) Mn^{+2}, (c)Fe^{+2}, and (d) $Co^{+2.}$


a)
10000
8000
6000
4000
2000
Total Counts
-100
0
+100
Apparent Zeta Potential
(mV)


b)
10000
8000
6000
4000
2000
Total Counts
-30
0
+30
Apparent Zeta Potential
(mV)

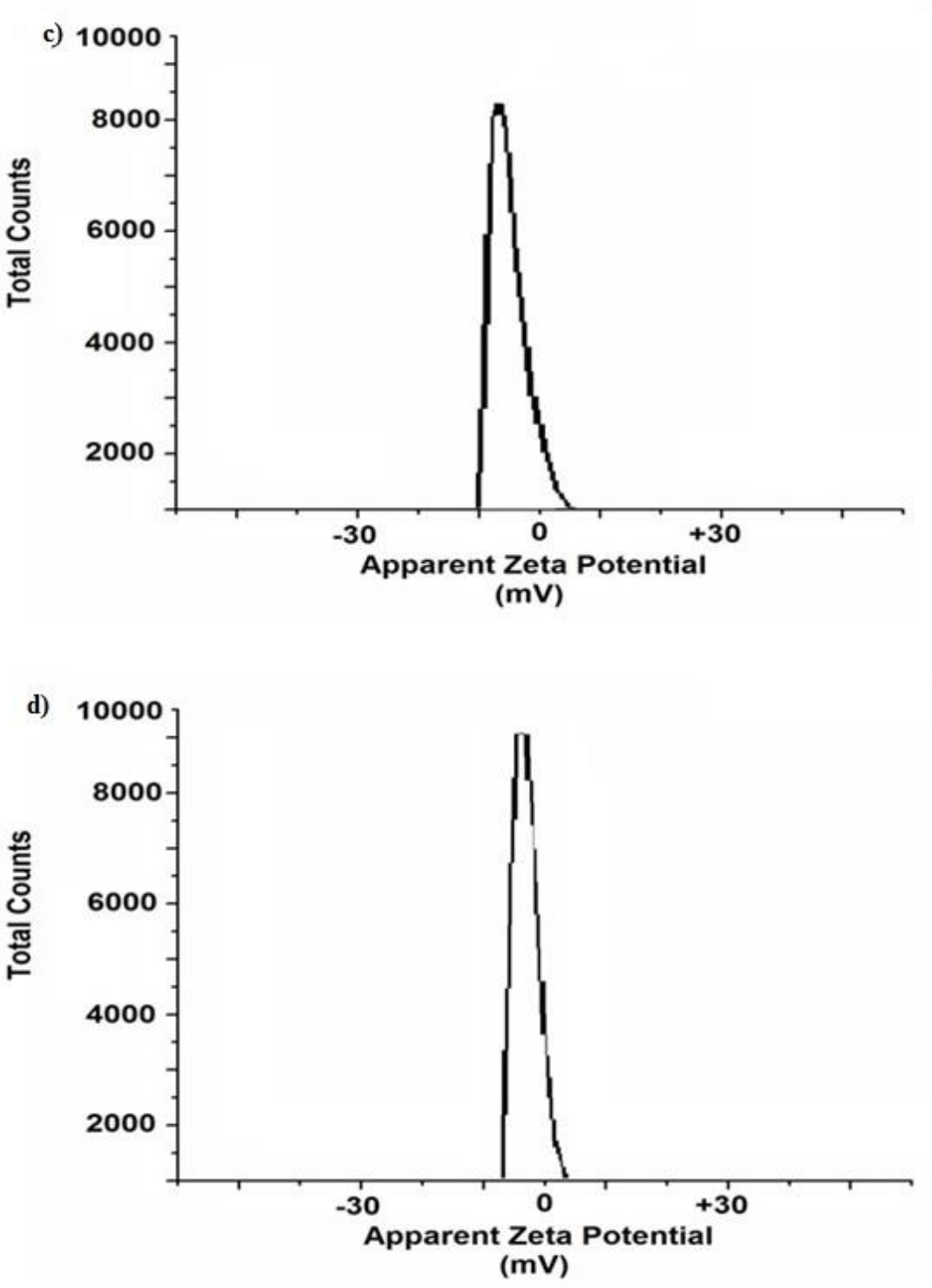
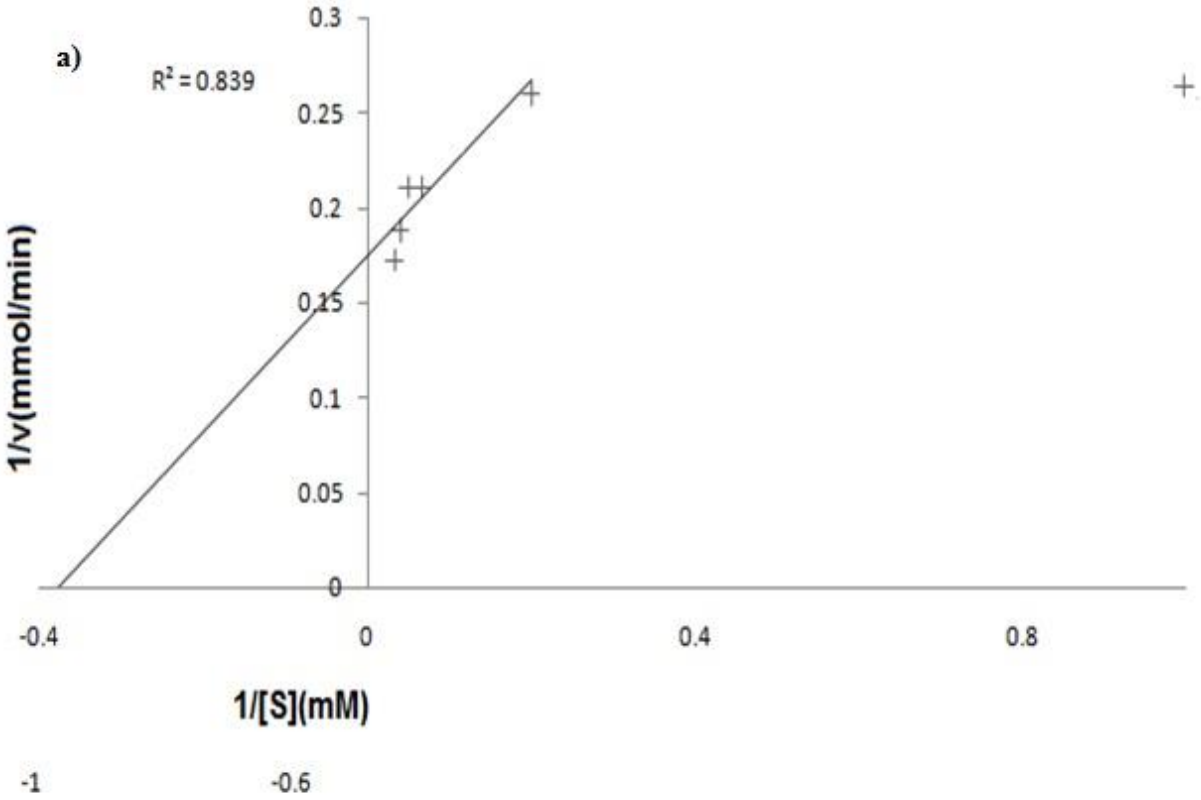
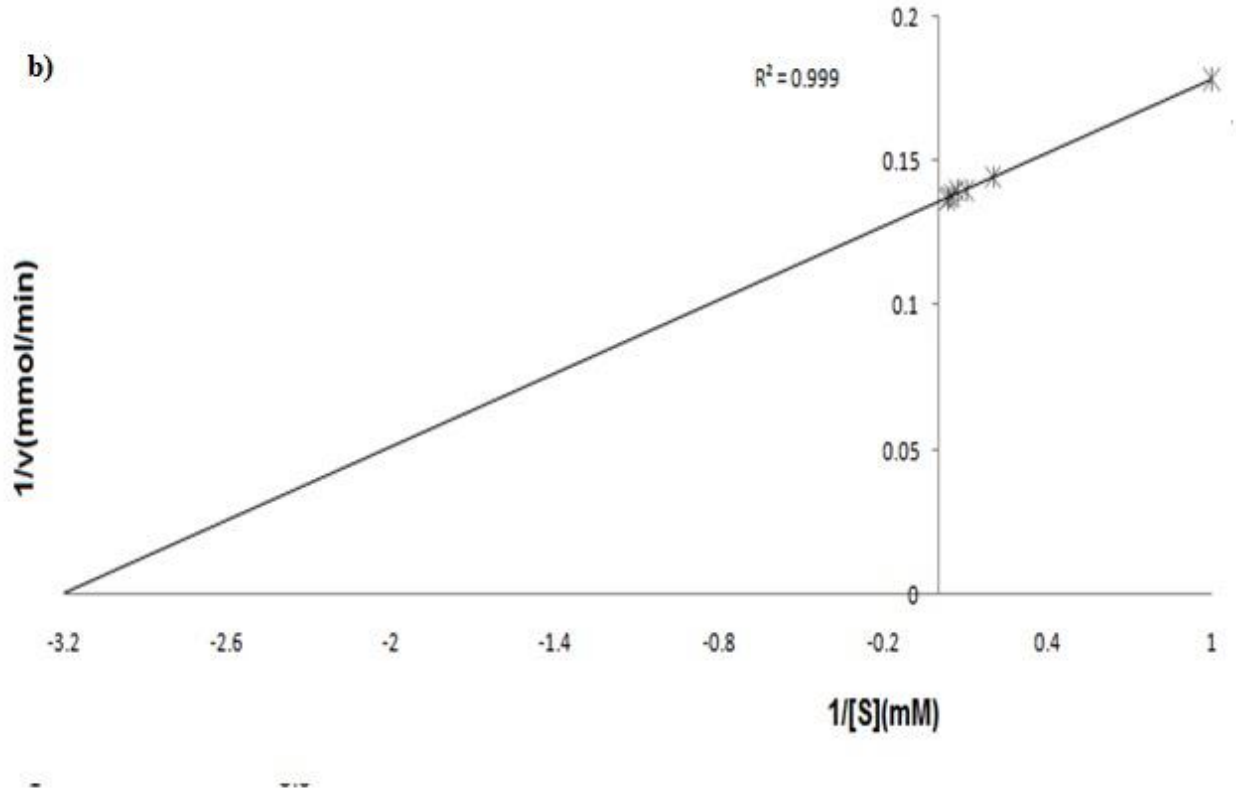


Figure S6. Zeta potentials of (a) sodium alginate (salt) and alginate nanogels crosslinked with: (b) Mn^{2+}, (c) Fe^{2+} , and (d) Co^{2+}.


a)
R² = 0.839
0.3
0.25
0.2
0.15
0.1
0.05
0
1/v(mmol/min)
-0.4
0
0.4
0.8
1/[S](mM)

-1 -0.6


b)
R² = 0.999
0.2
0.15
0.1
0.05
0
1/v(mmol/min)
-3.2
-2.6
-2
-1.4
-0.8
-0.2
0.4
1
1/[S](mM)

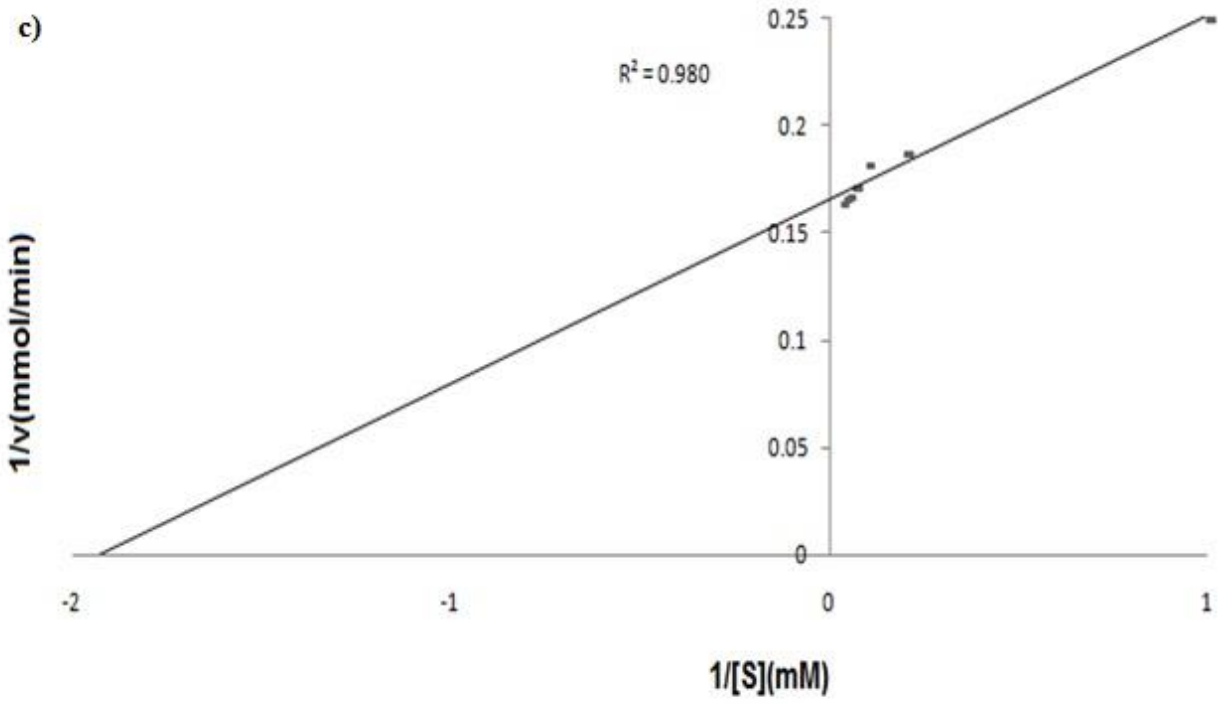


Figure S7. The Lineweaver burk plot obtained at enzyme conc. of 5mg/ml in urease
encapsulated alginate nanogels crosslinked with: (a) Mn^{2+}, (b) Fe^{2+}, and (c) Co^{2+}.