Supporting Information

Supercritical Synthesis of Magnetite-Reduced Graphene Oxide Hybrid with Enhanced Adsorption Properties toward Cobalt & Strontium Ions

Ahmad Tayyebi*, Mohammad Outokesh*

Department of Energy Engineering, Sharif University of Technology, Azadi Ave. P.O. Box: 113658639, Tehran, Iran.

***Corresponding author's email address: Outokesh@sharif.edu, atayebi162@gmail.com**

RSC Advances

Supplemental Information, 19 Pages with 14 Figures and 2 Tables

List of Supplemental Figures

Figure S14: Desorption of Co^{2+} ions from M-RGO using different concentration of hydrochloridric acid (HCl).

List of Supplemental Tables

Table S1: Constants of linear fit of Ln K_d Vs. Ce ($LnK_d=A+BC_e$) for Co^{2+} removal onto M-RGO.

Table S2: Constants of linear fit of Ln Kd Vs. Ce ($LnK_d=A+BC_e$) for Sr^{2+} removal onto M-RGO.

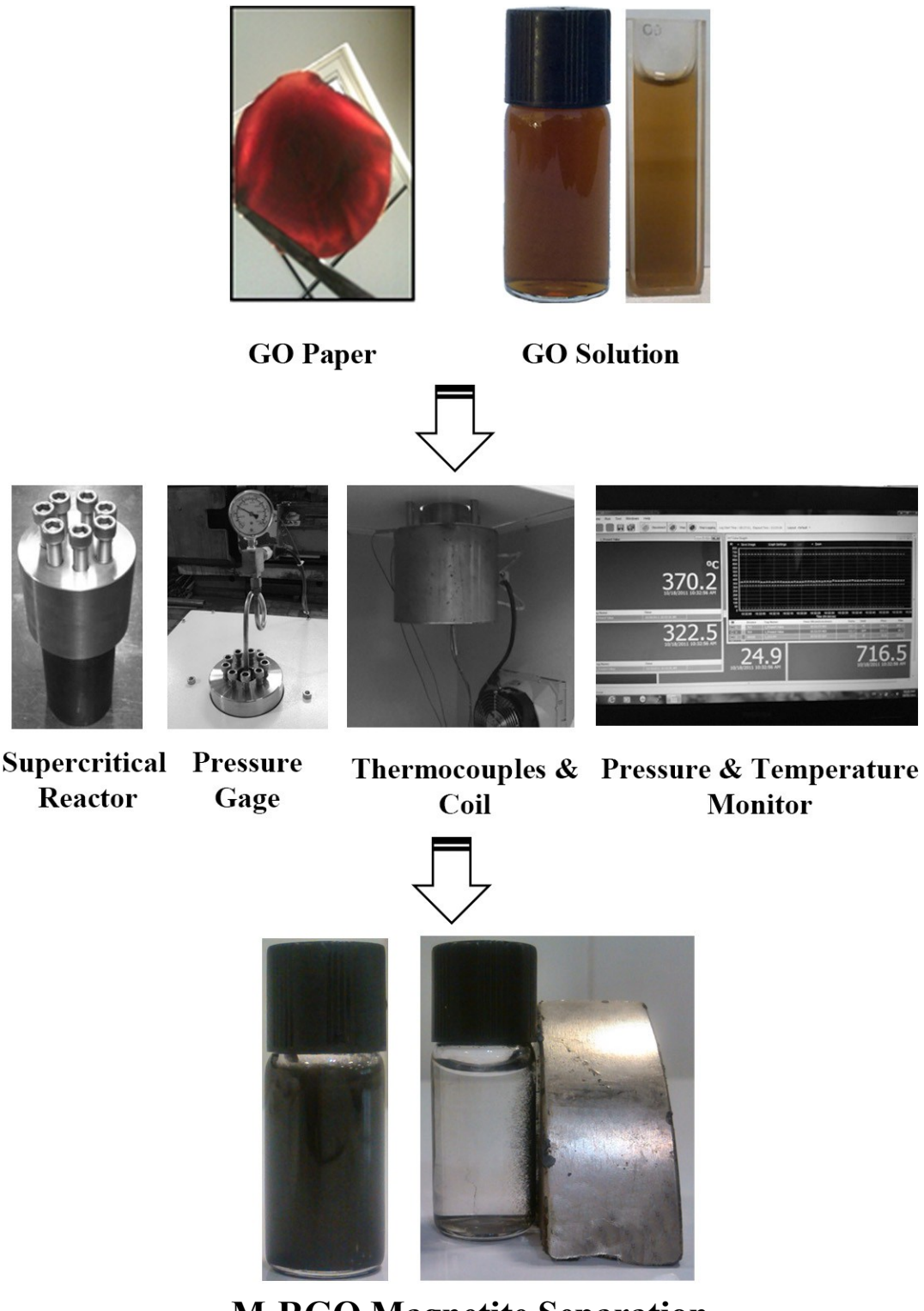
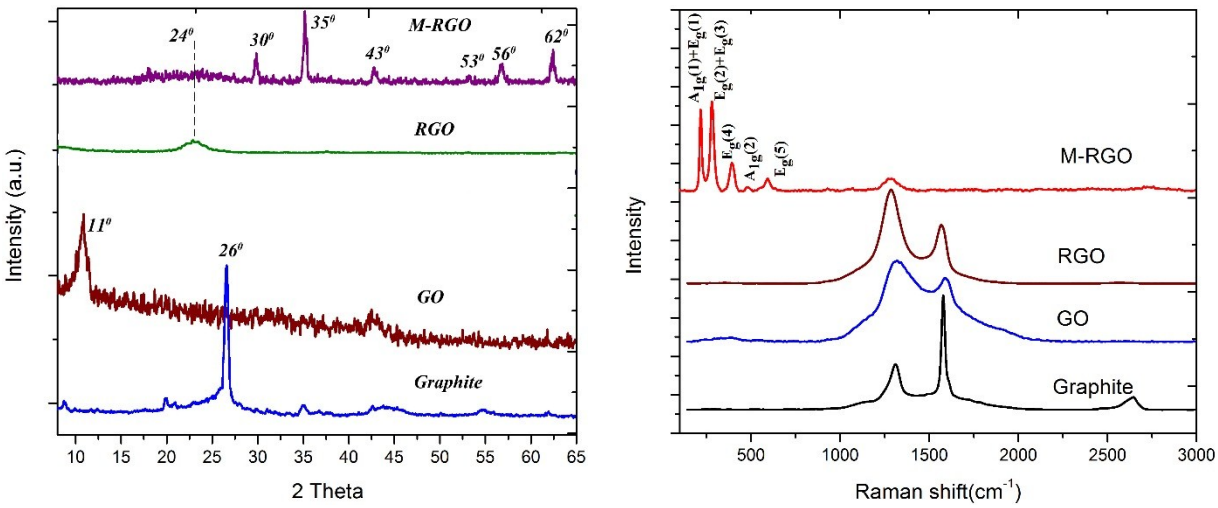
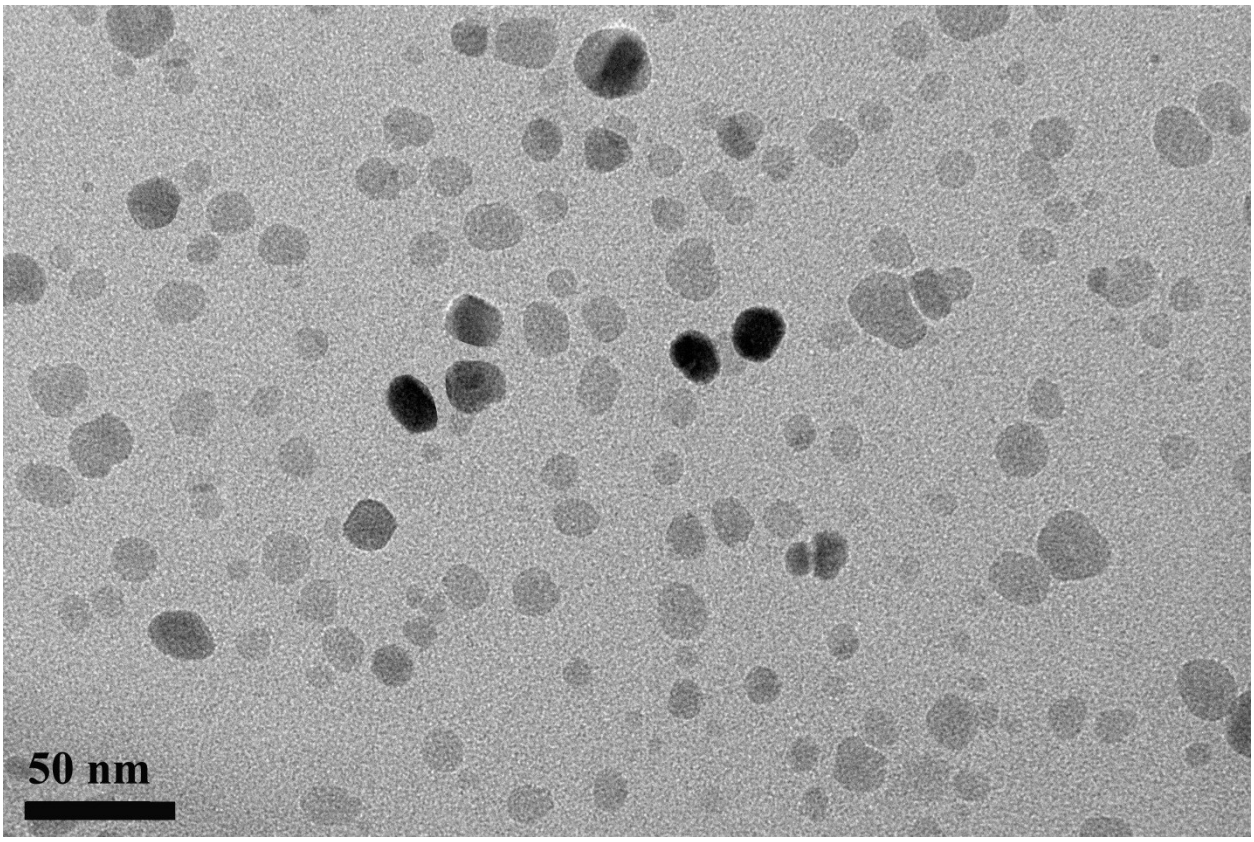


Figure S1: schematic illustration of M-RGO synthesis procedure**.**

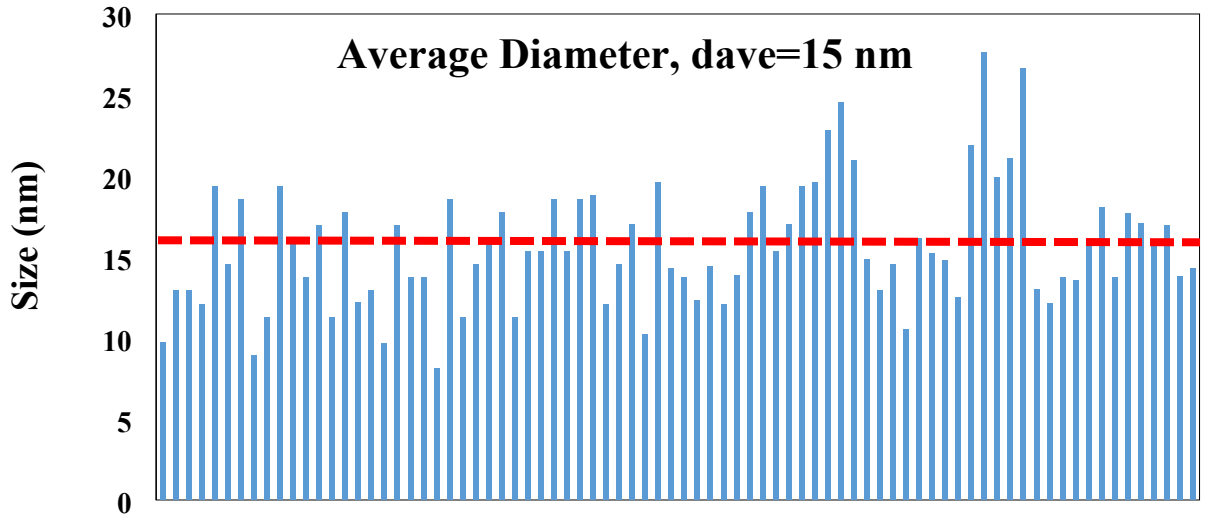


(a) **(b)**

Figure S2: (a) XRD patterns of prepared materials, and (b) Raman Spectra of synthesized materials (Graphite, GO, RGO, M-RGO)

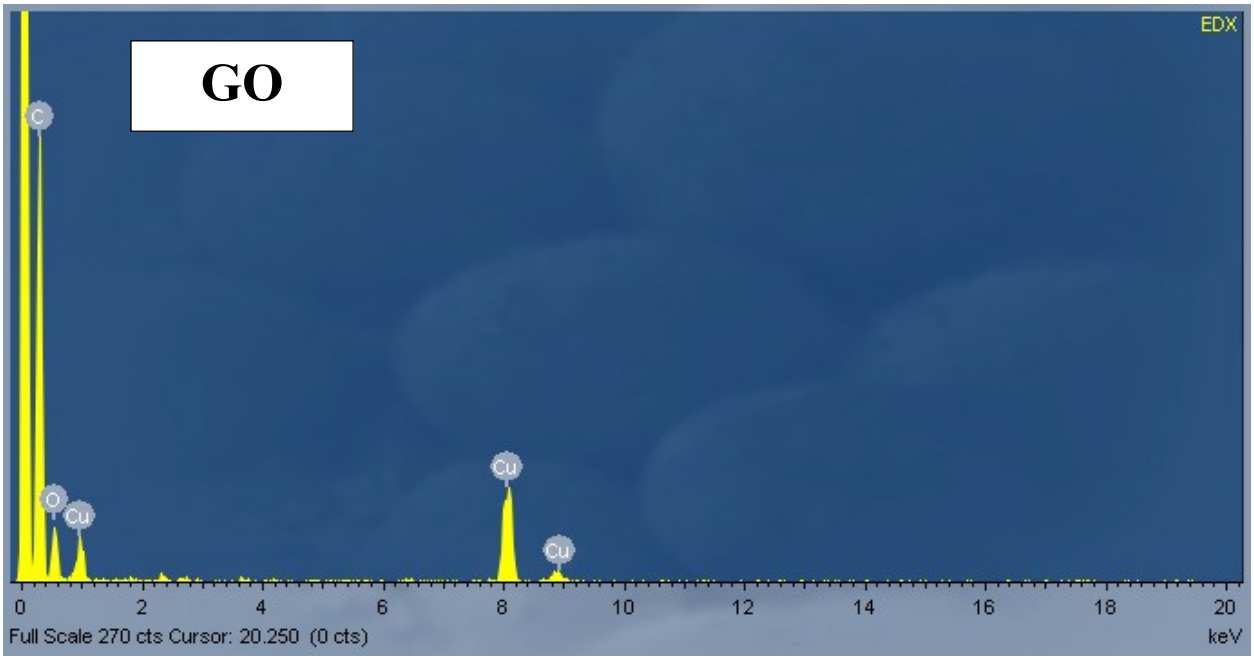


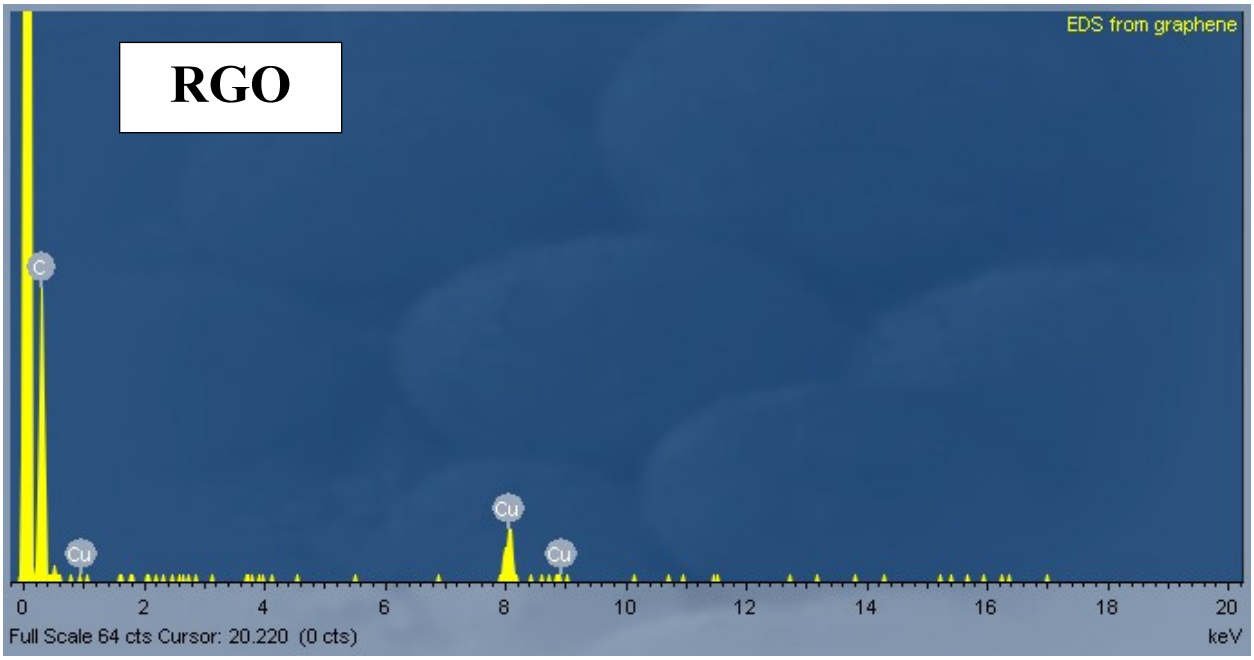
(a)



(b)

Figure S3: (a) Low resolution TEM image of M-RGO synthesized using supercritical methanol, and (b) corresponding size distribution of magnetite NPs with an average diameter of 15 nm.


EDX
GO
C
O
Cu
Cu
Cu
0
2
4
6
8
10
12
14
16
18
20
Full Scale 270 cts Cursor: 20.250 (0 cts)
keV


EDS from graphene
RGO
C
Cu
Cu
Cu
0
2
4
6
8
10
12
14
16
18
20
Full Scale 64 cts Cursor: 20.220 (0 cts)
keV

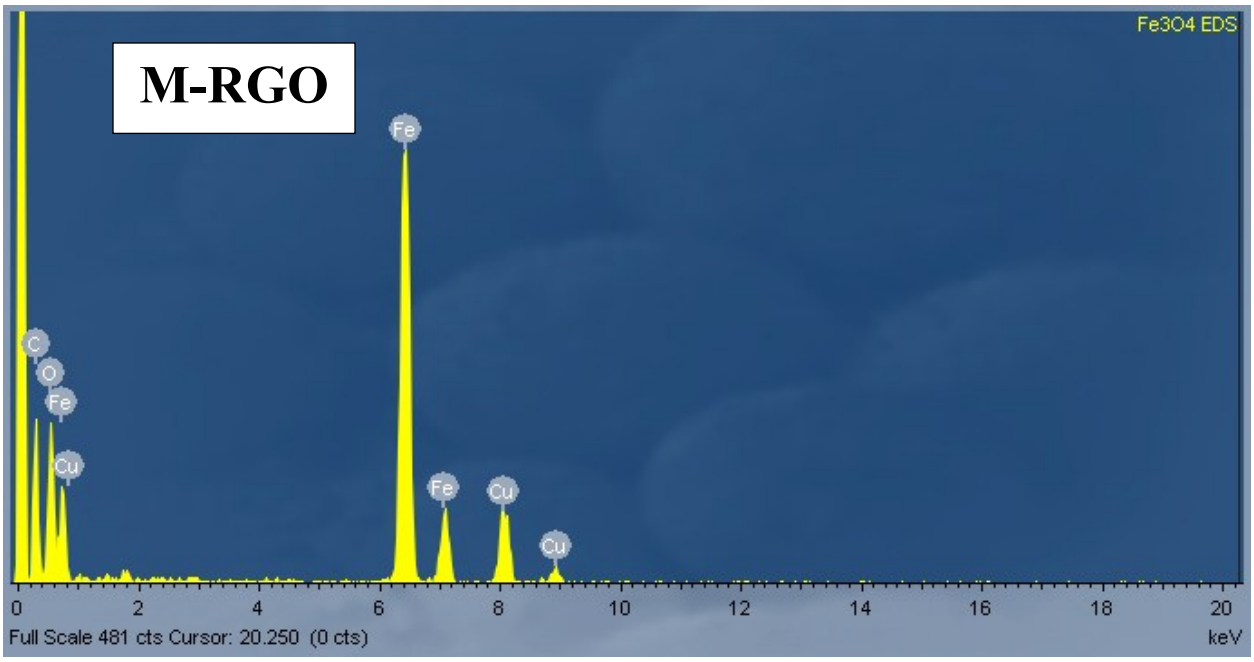


Figure S4: EDX analysis of GO, RGO, and M-RGO.

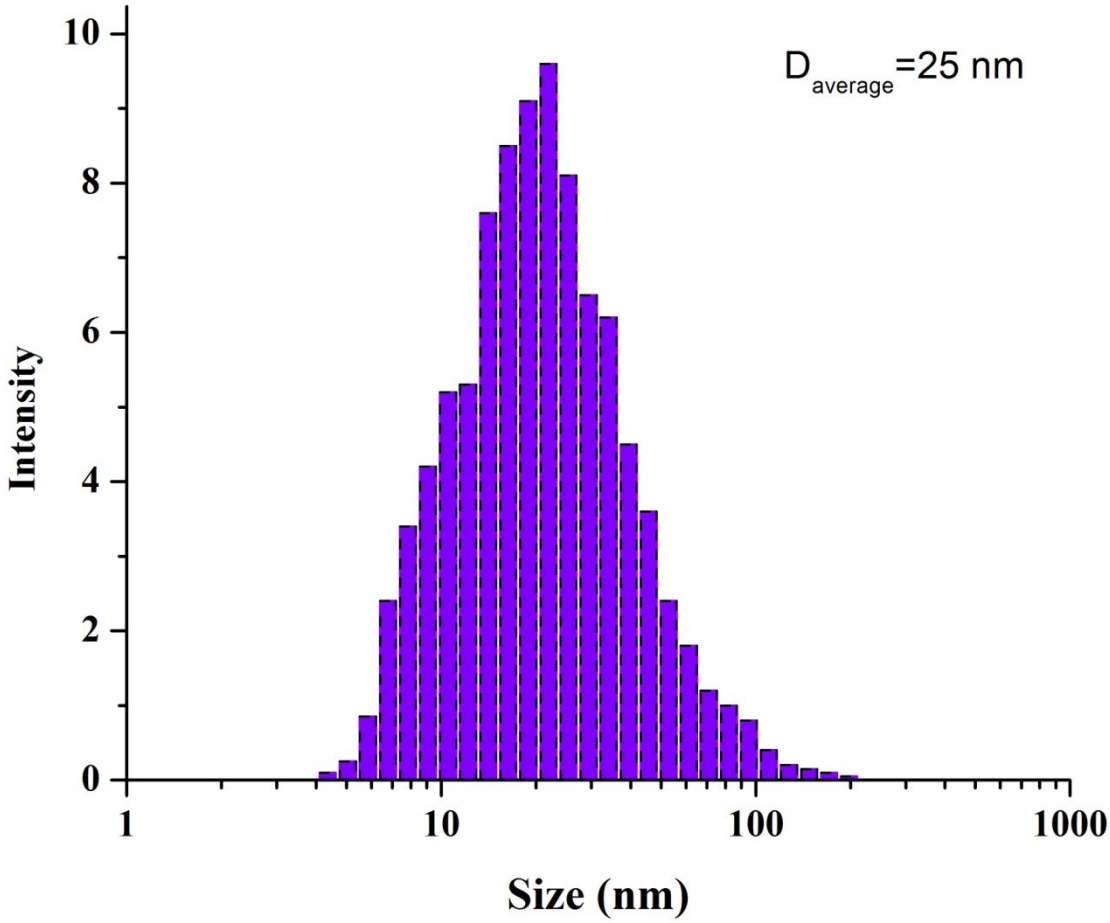


Figure S5: DLS size distribution of Fe_3O_4 NPs nanoparticles in water.

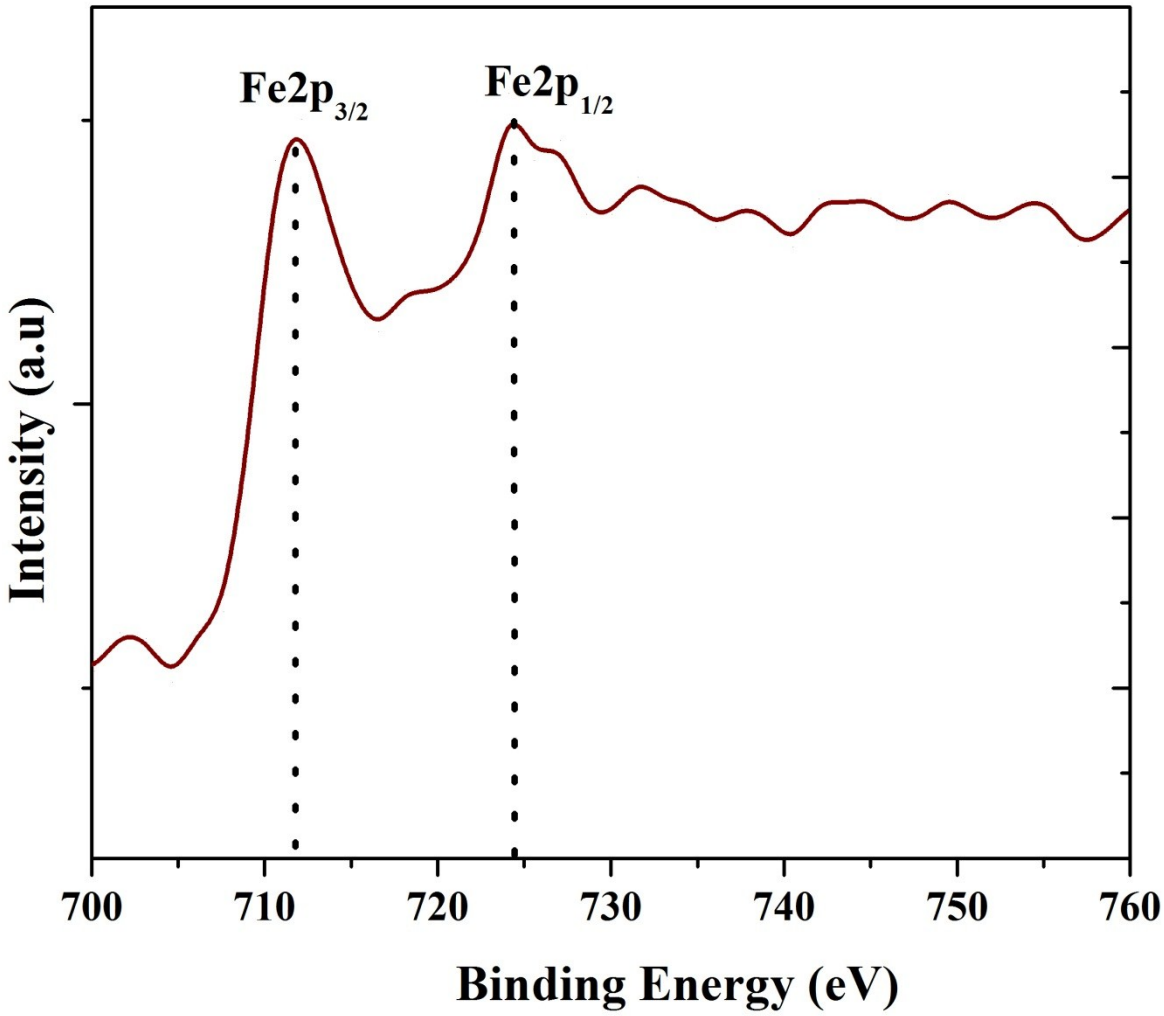


Figure S6: High resolution peak Fe2p core level peak.

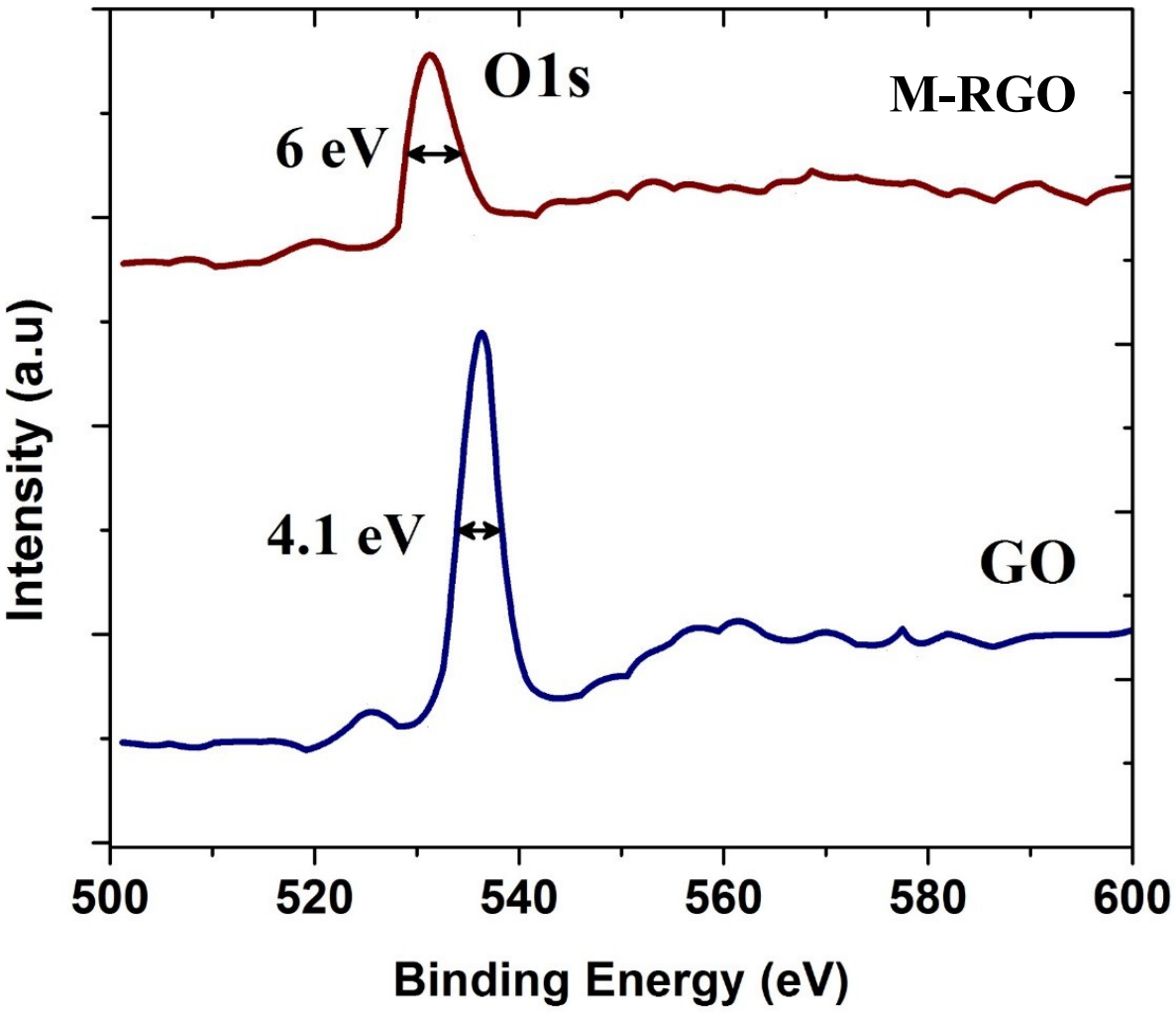


Figure S7: FWHM of High resolution of O1s core level peak.

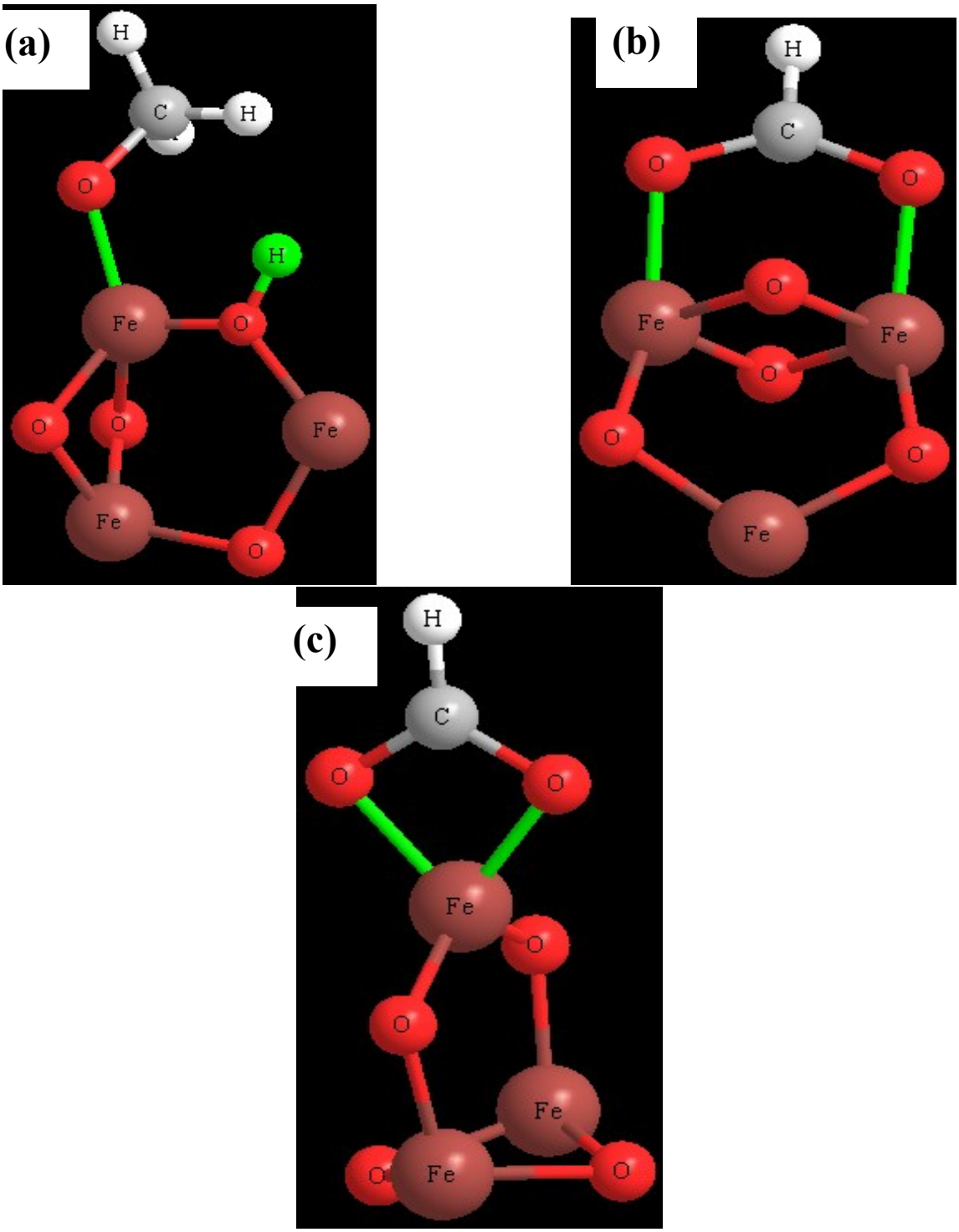
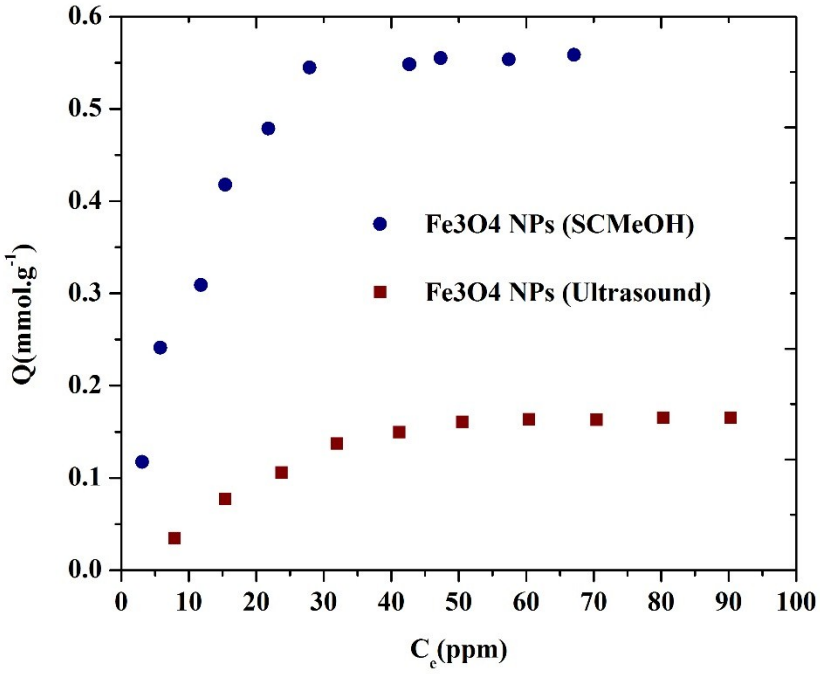
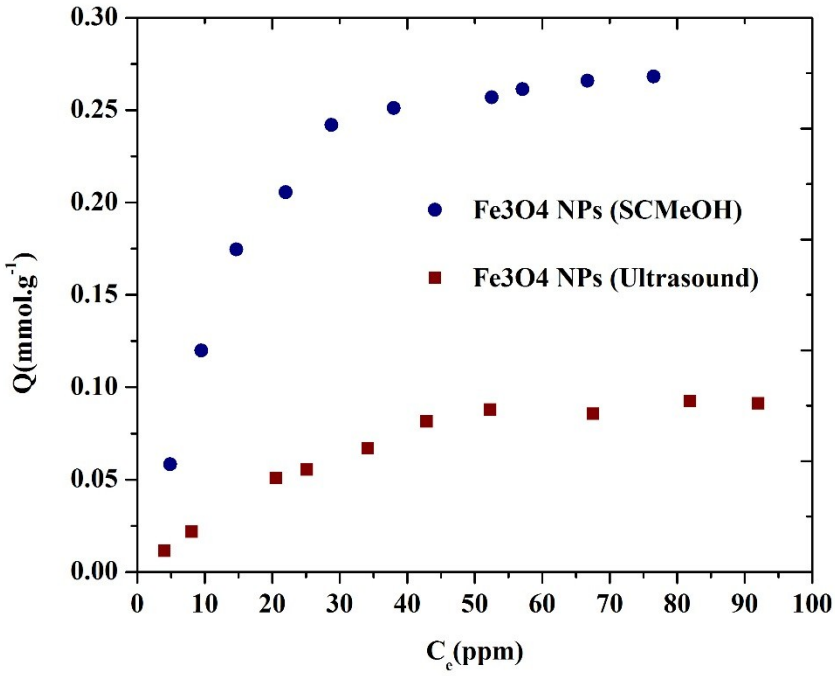


Figure S8: 3-Dimentional schematic illustration of methanol interaction with Fe3O4 NPs surface.



(a)



(b)

Figure S9: Adsorption behavior of Fe3O4 NPs synthesized by two different method (Ultrasound assisted chemical precipitation and supercritical methanol) for (a) Co2+, and (b) Sr2+ ions from aqueous solution at pH 6.5 and T=298 K.

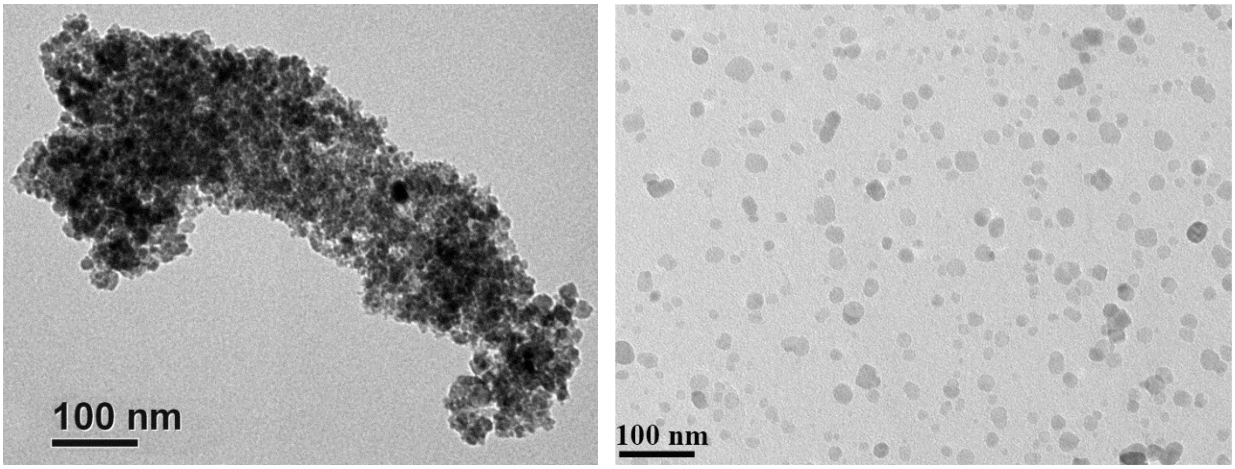
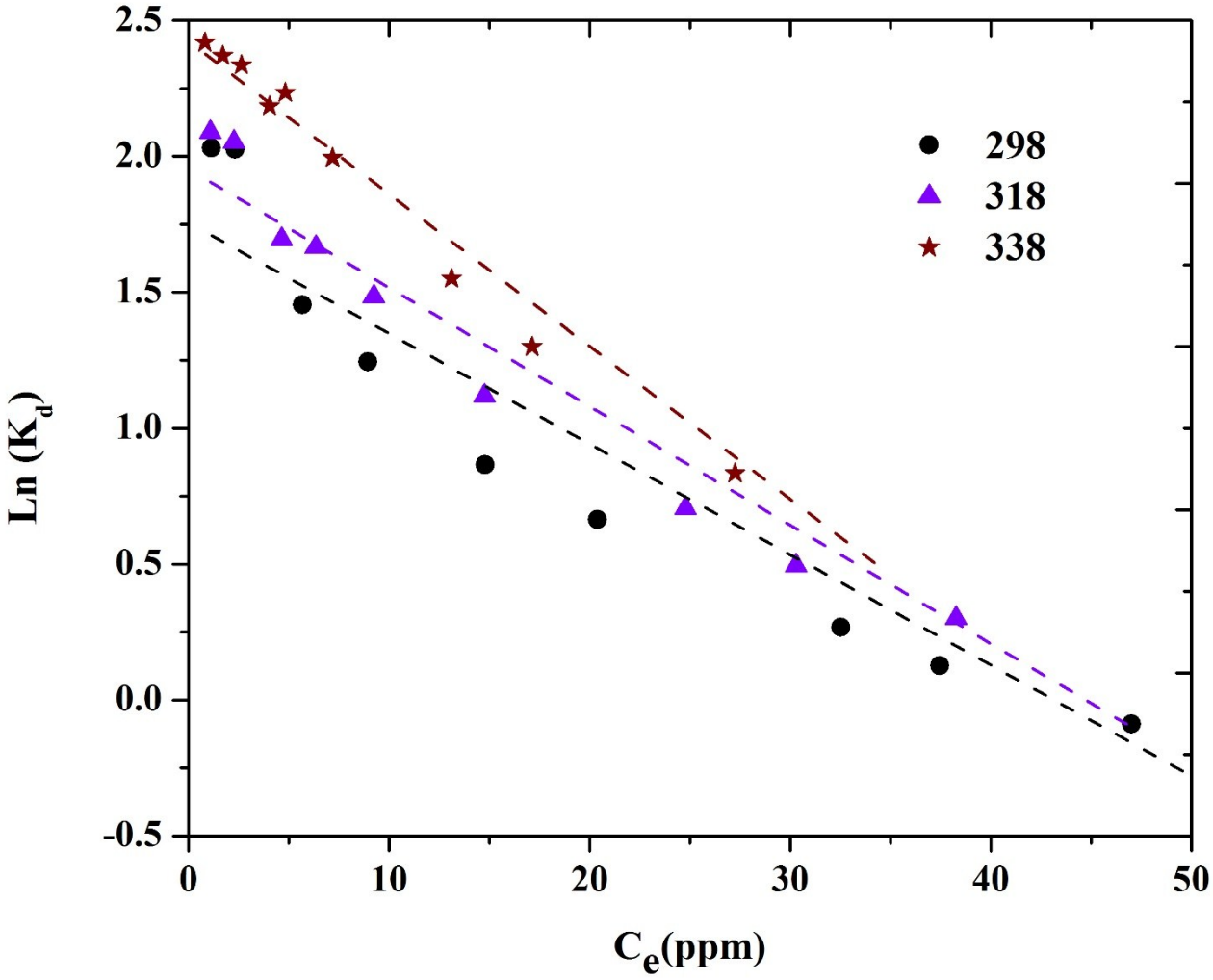


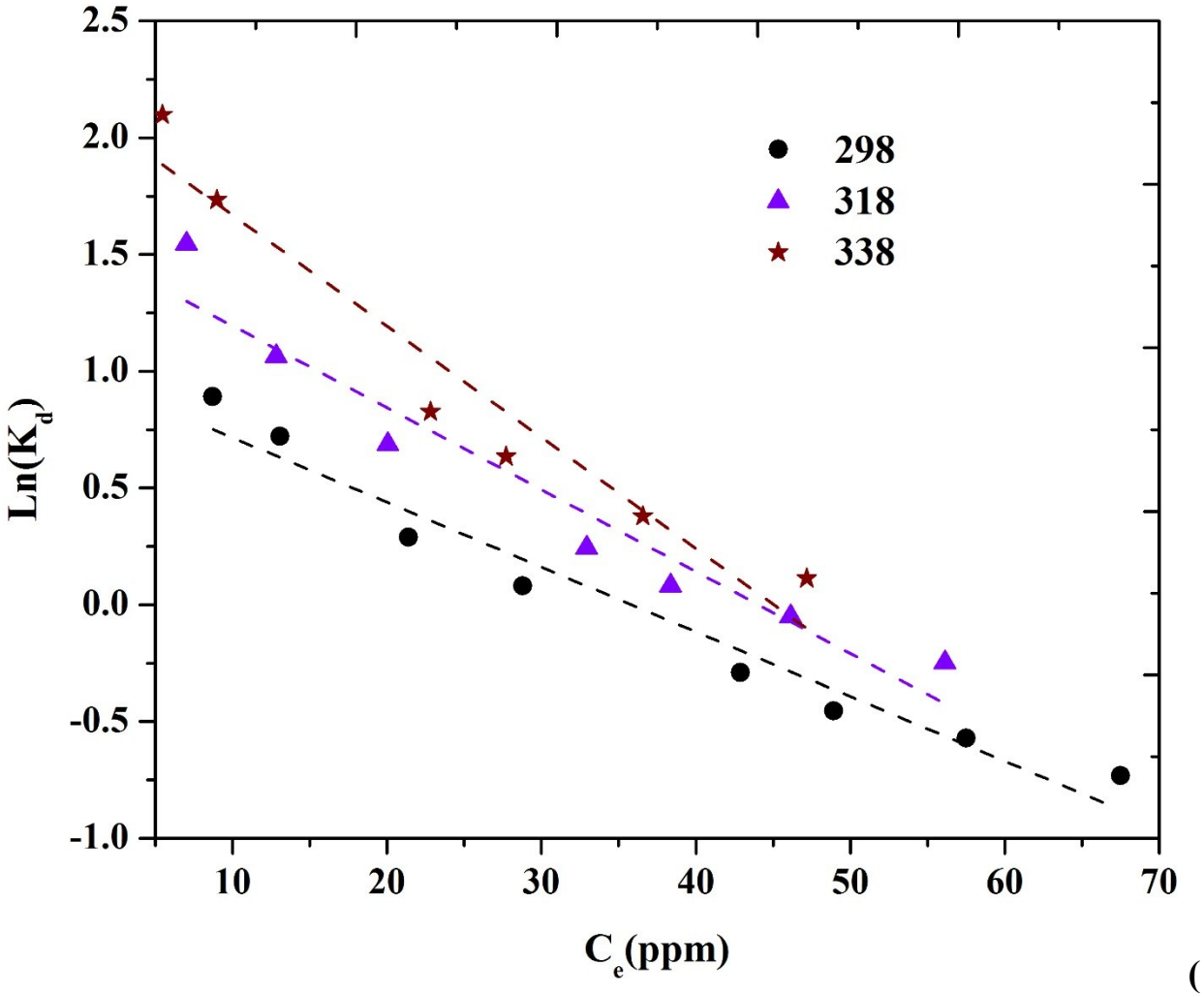
Figure S10: Transmission electron microscopy (TEM) images of (a) Fe_3O_4 NPs bulk, and (b) Fe_3O_4 NPs on the surface of graphene sheet.



(a)

Table S1: Constants of linear fit of Ln K_d Vs. Ce ($LnK_d=A+BC_e$) for Co^{2+} removal onto M-RGO.

T(K)	A	B	R^2
298	1.7	-0.04	0.91
318	2.0	-0.044	0.95
338	2.4	-0.056	0.98



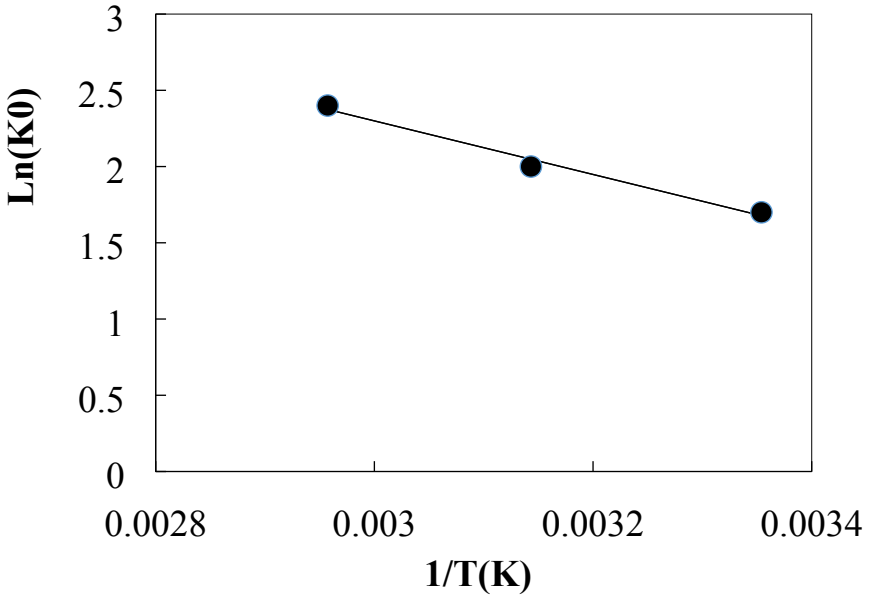
(

b)

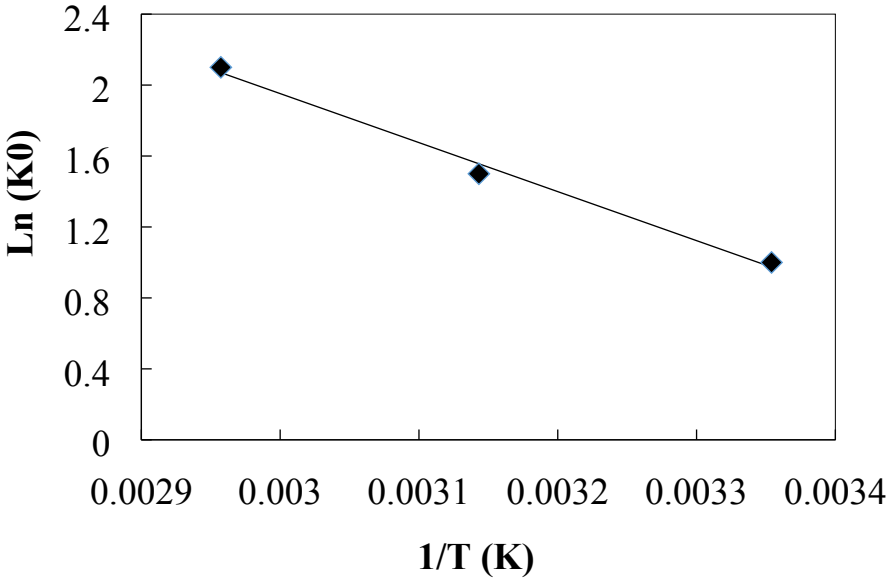
Table S2: Constants of linear fit of Ln Kd Vs. Ce ($LnK_d=A+BC_e$) for Sr^{2+} removal onto M-RGO.

T(K)	A	B	R^2
298	1.0	-0.027	0.96
318	1.5	-0.035	0.93
338	2.1	-0.047	0.93

Figure S11: Linear fitting of Ln K_d vs. C_e at pH=6.5 for (a) Co^{2+} ions; and (b) Sr^{2+} ions in aqueous solutions.



(a)



(b)

Figure S12: Vant't Hoff plot of LnK^0 versus 1/T for (a) Co^{2+}, and (b) Sr^{2+} ions.

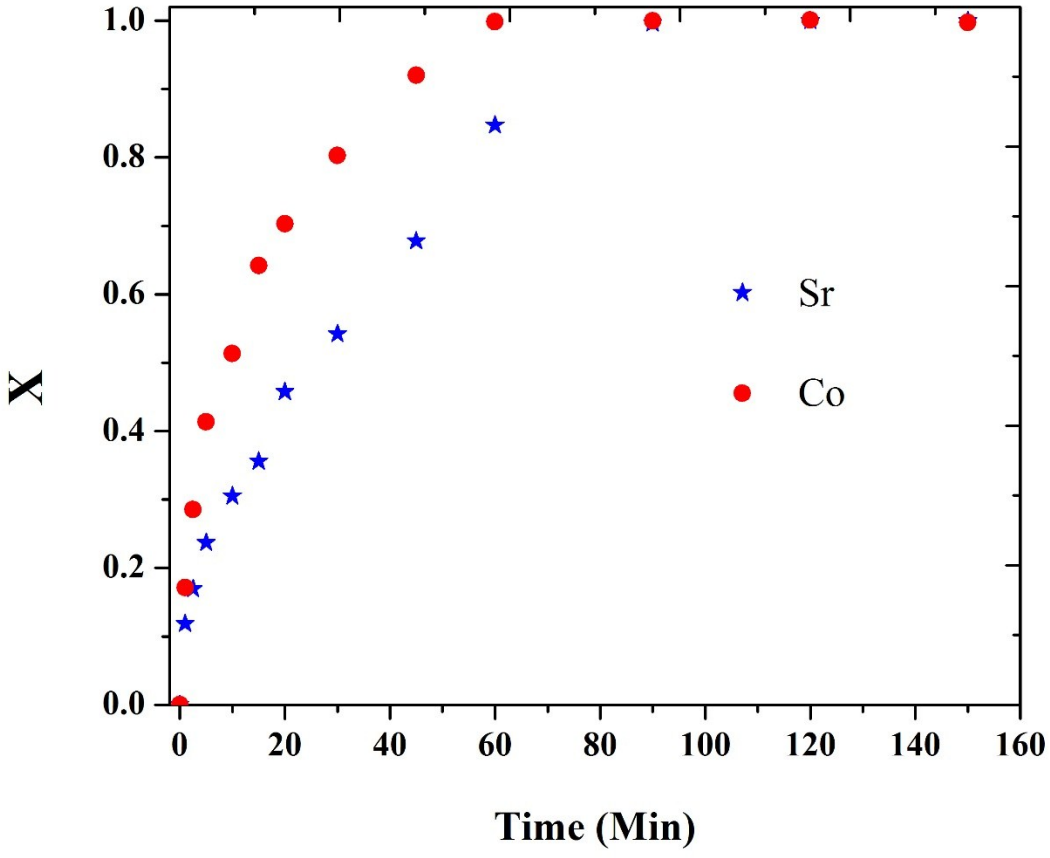


Figure S13: Comparison between the uptake rates in a normalized coordination (X).

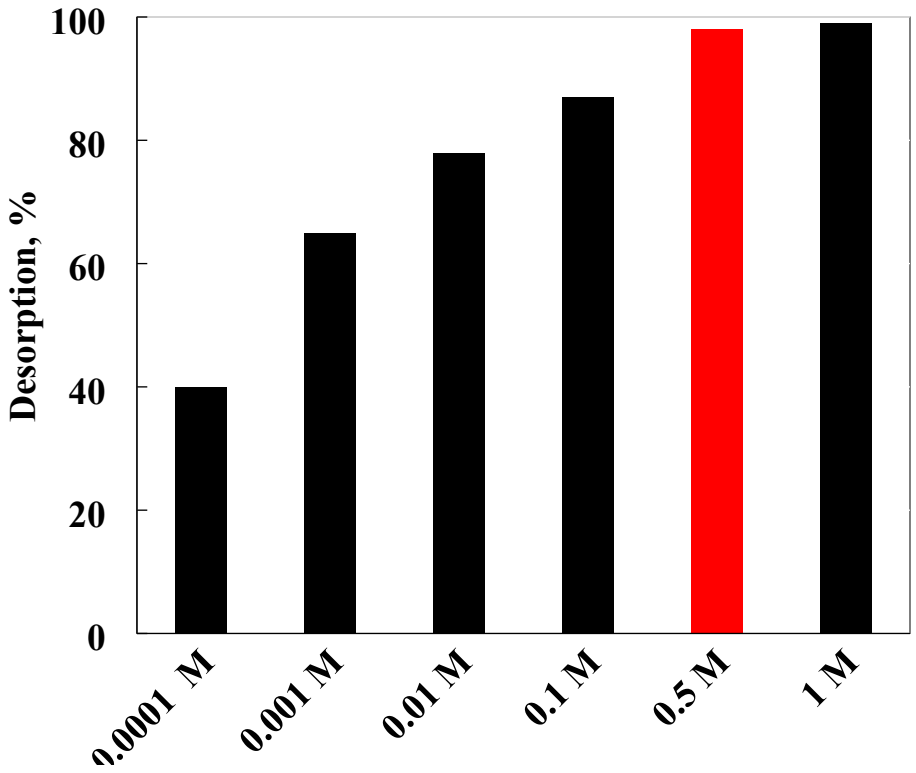


Figure S14: Desorption of Co^{2+} ions from M-RGO using different concentration of hydrochloridric acid (HCl).