sustainability

Supplementary Materials:

Removal of ZnO Nanoparticles from Natural Waters by Coagulation-Flocculation Process: Influence of Surfactant type on Aggregation, Dissolution and Colloidal Stability

Rizwan Khan [1], Muhammad Ali Inam [1], Muhammad Mazhar Iqbal [1], Muhammad Shoaib [1]; Du Ri Park [1], Kang Hoon Lee [2], Sookyo Shin [1], Sarfaraz Khan [3] and Ick Tae Yeom [1,*]

[1] Graduate School of Water Resources, Sungkyunkwan University (SKKU) 2066, Suwon 16419, Korea; rizwankhan@skku.edu (R.K.); aliinam@skku.edu (M.A.I.); mazhar0559@skku.edu; (M.M.I.); changezi@skku.edu (M.S.); enfl8709@skku.edu (D.R.P.); tkssk08@gmail.com (S.S.)

[2] Center for Built Environment, Sungkyunkwan University, (SKKU) 2066, Suwon 16419, Korea; diasyong86@gmail.com

[3] Key Laboratory of the Three Gorges Reservoir Region Eco-Environment, State Ministry of Education, Chongqing University, Chongqing 400045, China; Sfk.jadoon@yahoo.com

* Correspondence: yeom@skku.edu

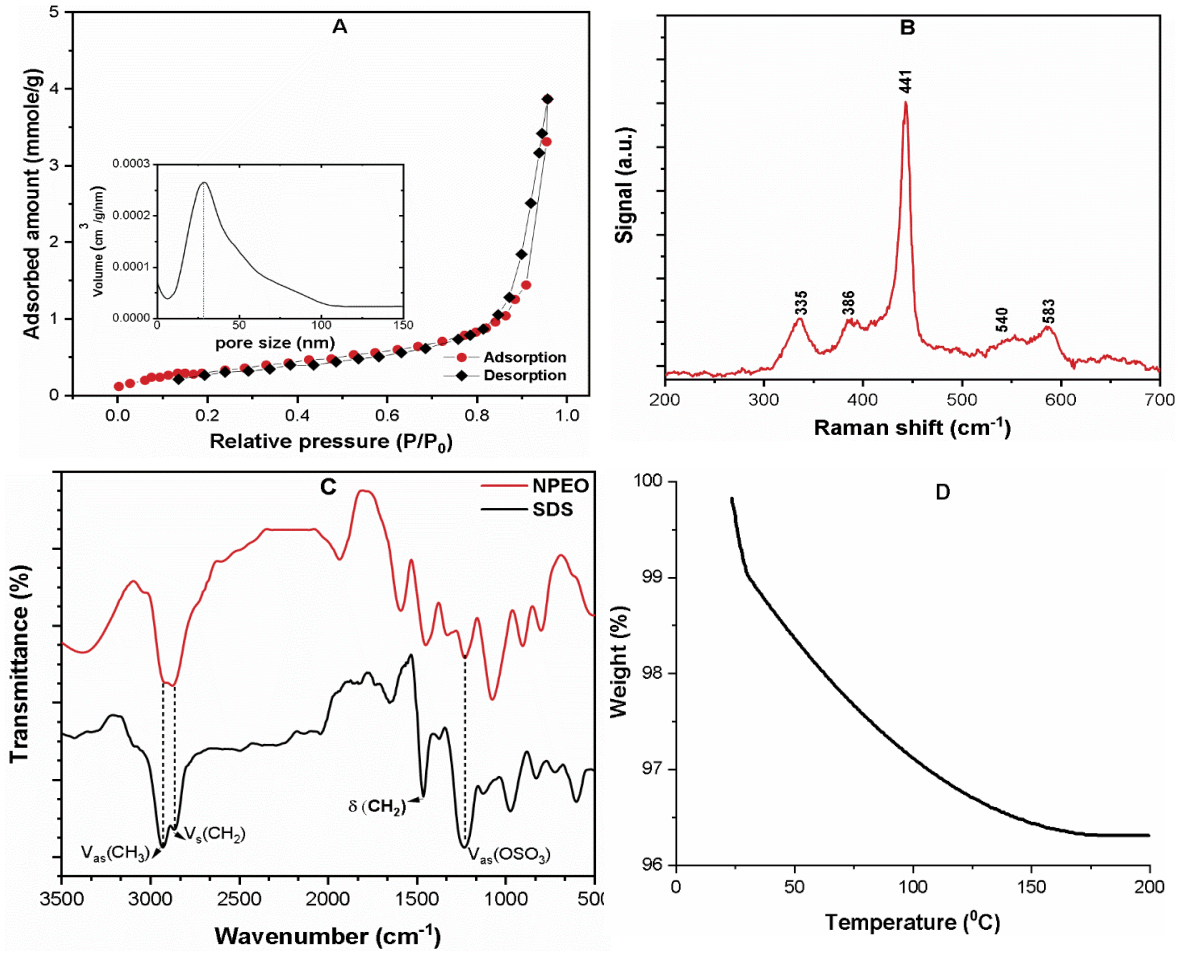

Figure S1. (A) BET surface Area; **(B)** Raman spectra of ZnO powder; and **(C)** FT-IR spectra of SDS and NPEO surfactants; **(D)** TGA% purity of ZnO NPs

1.1. Determination of ZnO NPs Iso-Electric Point in the Absence and Presence of Surfactants

The experiments were conducted at different pH ranges from 5 to 12 to determine the ZnO NPs iso electric point (pH iep) in the absence and presence of surfactants.. The measurements were made with an increment of 1.0 pH unit and at each pH ζ-potential measurements were recorded in triplicate using (Zeta-sizer NanoZS, Malvern, Worcestershire, UK). As shown in Figure S2 in the absence of surfactants the pHiep ZnO NPs was determined to be 9.2. The result of pHzpc determined in the current study in accordance with the previous studies [1–3] which report the pHzpc range from 8.7 to 9.4. However, after the addition of SDS and NPEO ions were adsorbed and caused a change to the zeta potential (Figure S2). In the case of adsorption of SDS the zeta potential was shifted into negative values, while addition of NPEO did not significantly affect the stability of ZnO NPs suspension[4,5]. This result showed that the addition of surfactant in NPs suspension may change its zeta potential and thus affect the colloidal stability.

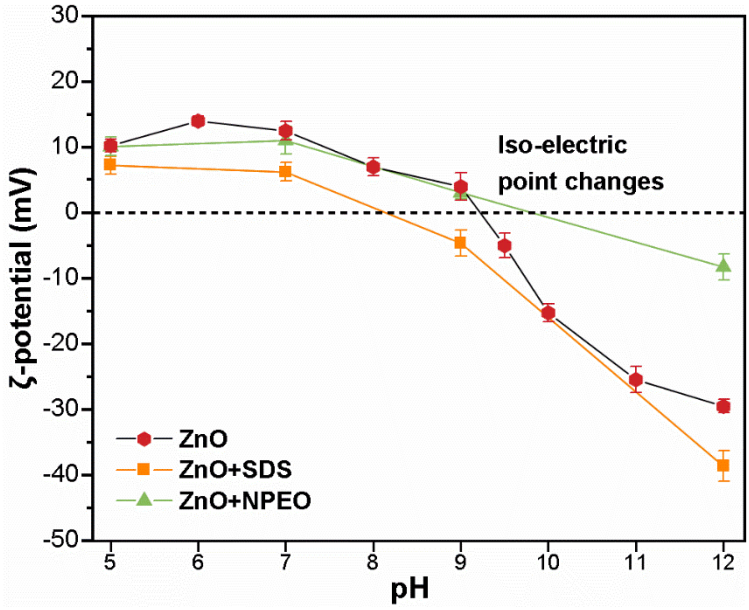

Figure S2. ζ-potential of ZnO (10 mg/L) in absence and presence of SDS/NPEO at various pH ranges.

Table S2. The composition of collected waters

Parameter	Unit	Tap water	Wastewater [a]
Ionic Strength	mM/L	0.002	8.90
Conductivity	us/cm	82.42	619
HCO_3	mg $CaCO_3$ /L	>80	-
TOC	mg/L	ND	15.68
K^+	mg/L	0.06	7.53
Na^+	mg/L	0.54	15.0
PO_4	mg/L	-	ND
SO_4^{2-}	mg/L	-	10.52
Cl^-	mg/L	0.28	22.40
Ca^{2+}	mg/L	0.81	16.11
Sb	mg/L	-	10.07
Mg^{2+}	mg/L	0.16	14.87
Fe	mg/L	-	ND
Cu	mg/L	-	0.39
As	mg/L	-	5.35

[a)] Showing diluted concentration of Wastewater

- shows not measured and ND shows Not detected

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