Supporting Information

Simple reactive milling preparation of photocatalytically active porous ZnO nanostructures using biomass derived polysaccharides

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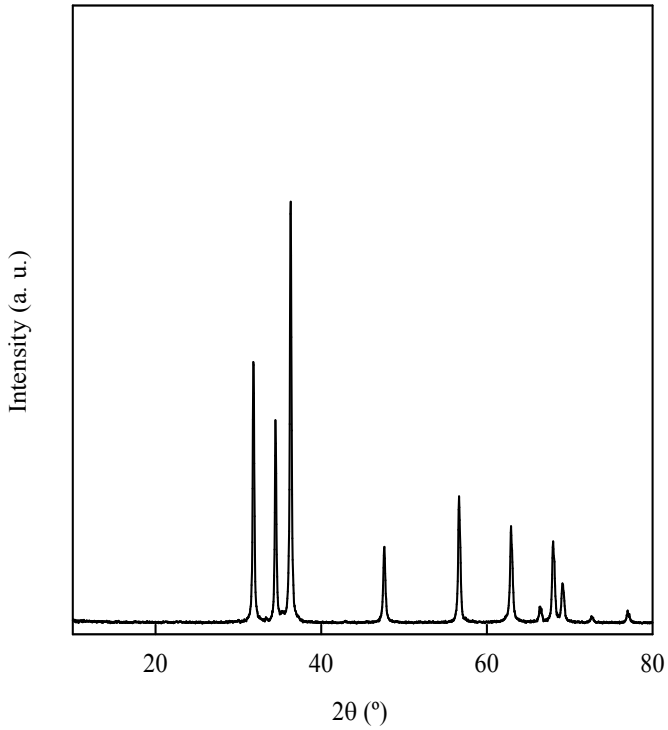
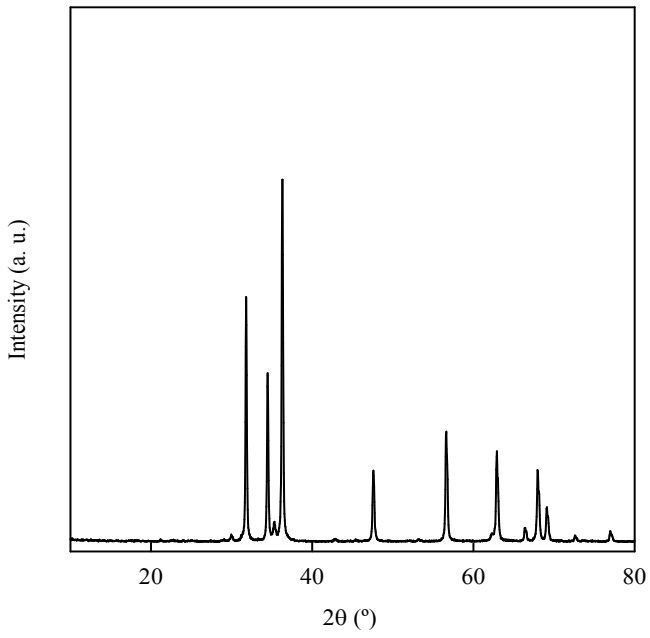
Table 1. Relevant textural properties of ZnO nanomaterials

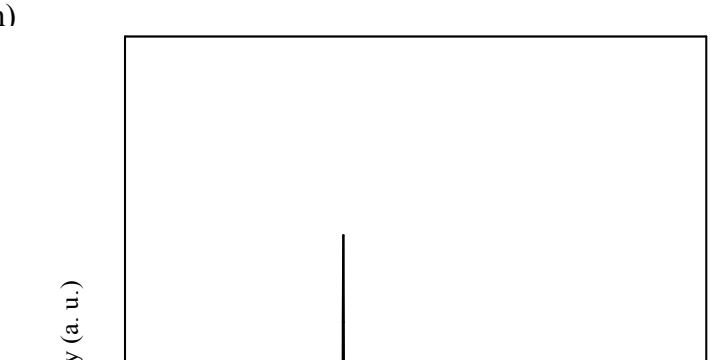
Material	S_{BET} (m^2/g)	D_{BJH} (nm)	V_{BJH} (ml/g)	NP size (XRD)[a]
ZnO 1:2	4 g $Zn(NO_3)_2$ 8 g Alginic acid 100 rpm, 30 min	<10	0.05	35
ZnO 1:2	4 gramos de $Zn(NO_3)_2$ 8 gramos Alginic acid 650 rpm, 30 min	<10	0.07	47



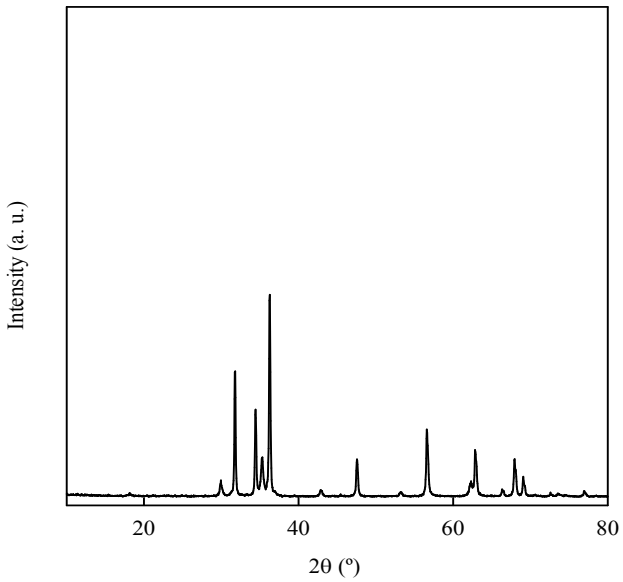
ZnO 1:1 alginic acid (4 g Zn $(NO_3)_2$, 4 gramos Alginic acid, 350 rpm, 30 min)



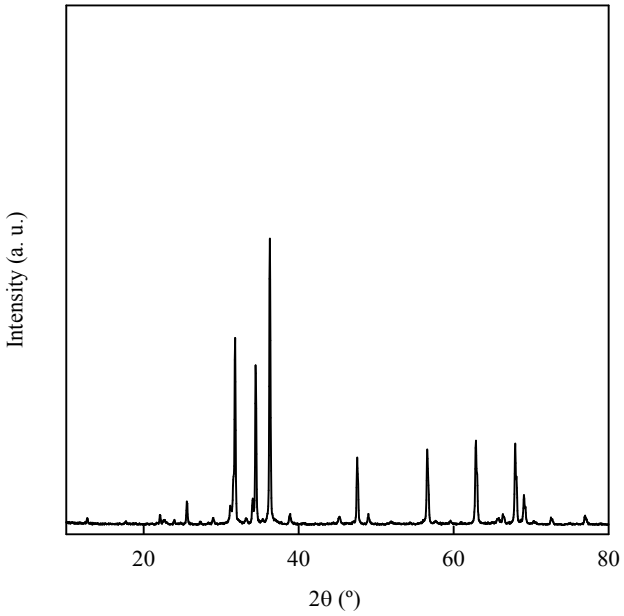
ZnO 1:2 alginic acid + urea (4 g (Zn $(NO_3)_2$ 8 g Alginic acid, 0.1 g Urea, 350 rpm, 30 min)



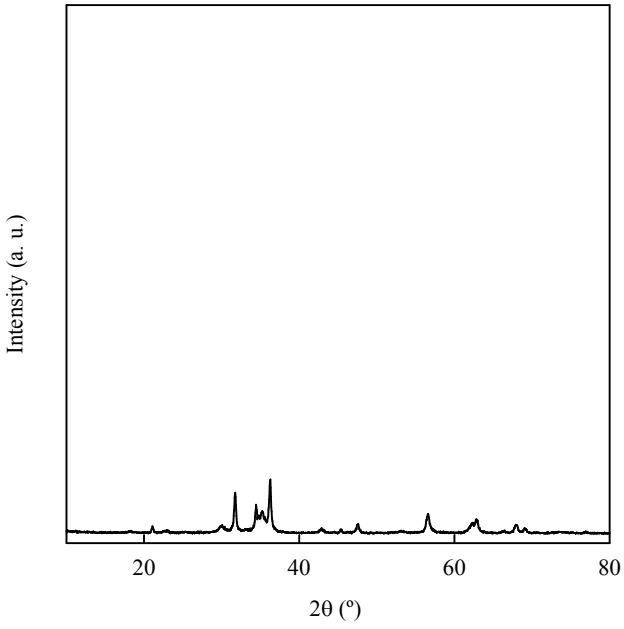
ZnO 1:2 alginic acid mild milling conditions (4 g (Zn $(NO_3)_2$ 8 g Alginic acid, 100 rpm, 30 min).



ZnO 1:2 alginic acid harsh milling conditions (4 g (Zn $(NO_3)_2$ 8 g Alginic acid, 650 rpm, 30 min).



ZnO 1:2 alginic acid $ZnCl_2$ as precursor (4 g Zn Cl_2 8 g Alginic acid, 350 rpm, 30 min).



ZnO 1:16 alginic acid (0.56 g Zn $(NO_3)_2$, 9 g Alginic acid, 350 rpm, 30 min)

Elemental composition of various ZnO materials after calcination.

ZnO 1:2 alginic acid

Element	Weight%	Atomic%
O	19.82	49.33
Si	1.35	1.92
S	1.15	1.42
Zn	77.68	47.33

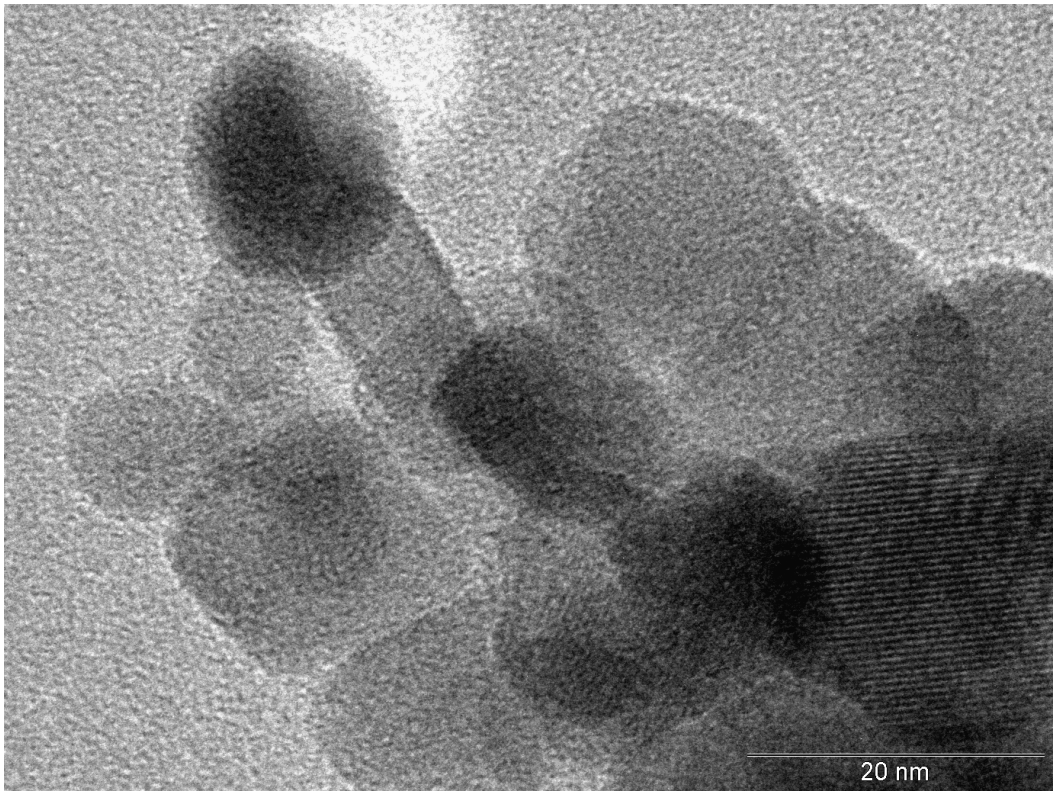
Zn 1:2 starch

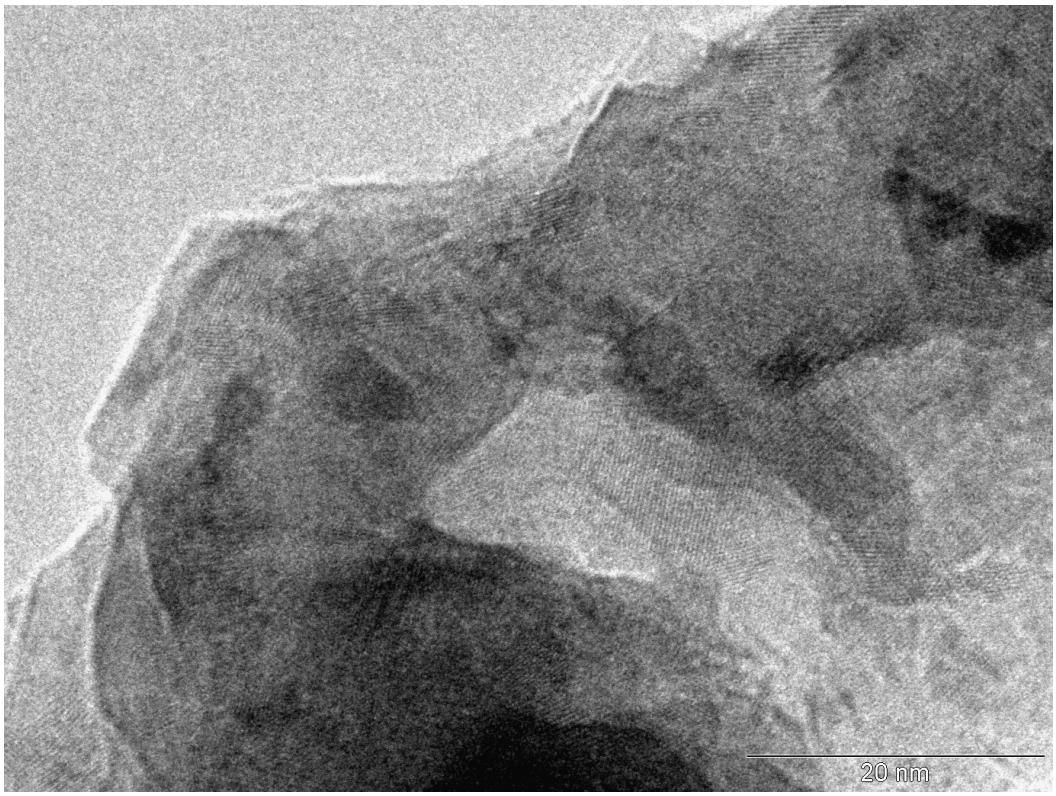
Element	Weight %	Atomic%
C	2.49	8.18
O	17.61	43.33
P	0.59	0.74
Zn	79.31	47.75

ZnO 1:2 alginic acid (Zn acetate as metal precursor)

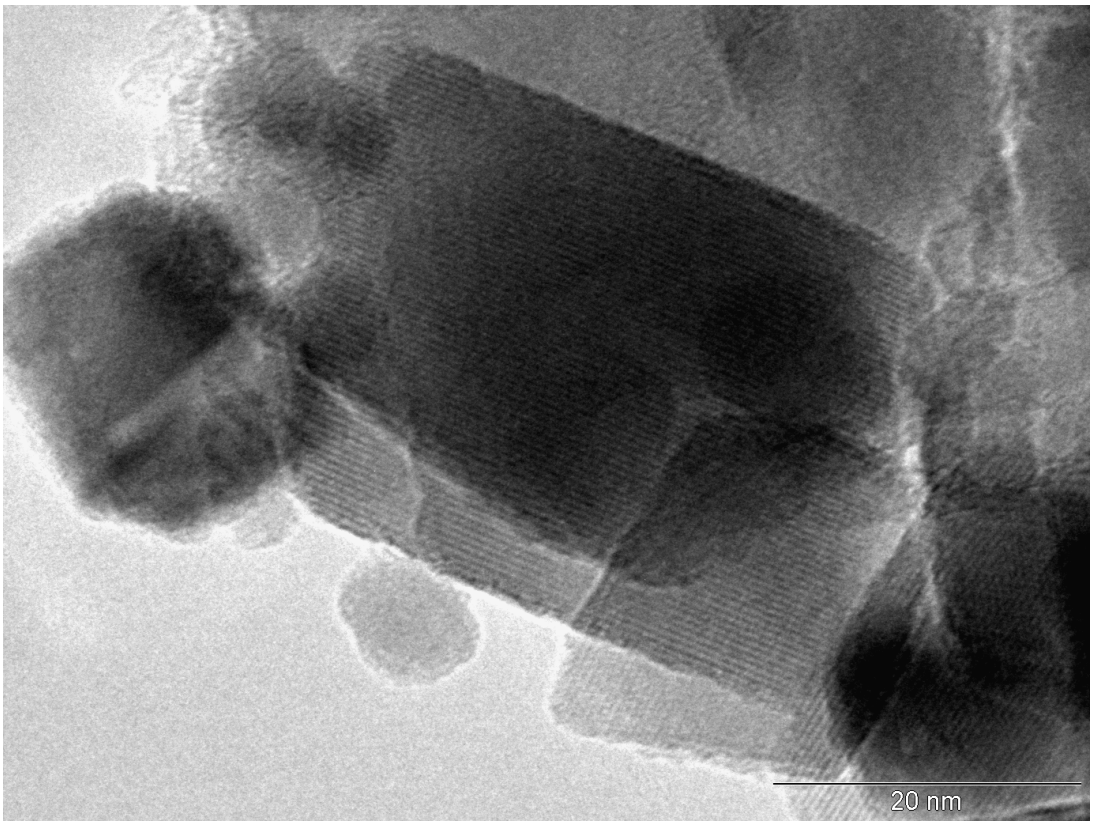
Element	Weight%	Atomic%
C	4.20	12.59
O	19.06	42.95
Si	1.40	1.80
S	1.02	1.14
Cl	0.60	0.61
K	0.26	0.15
Ca	0.85	0.77
Zn	72.56	39.99

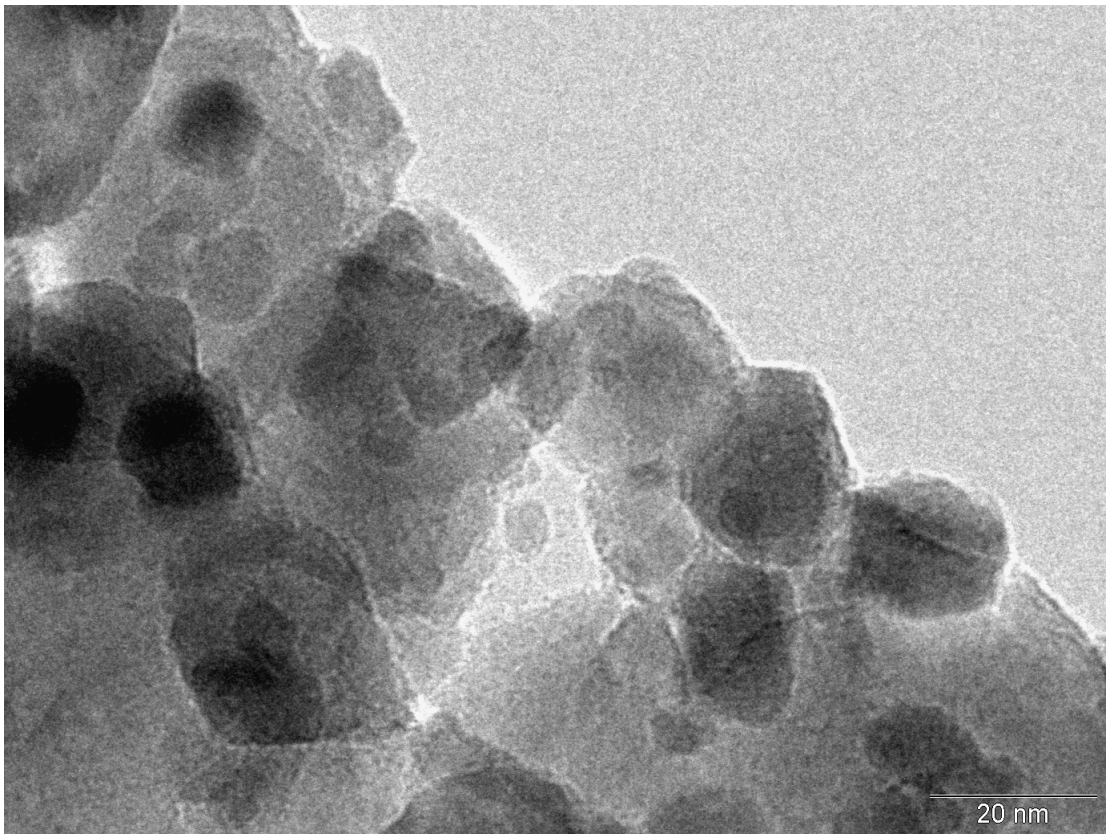
TEM images of representative materials



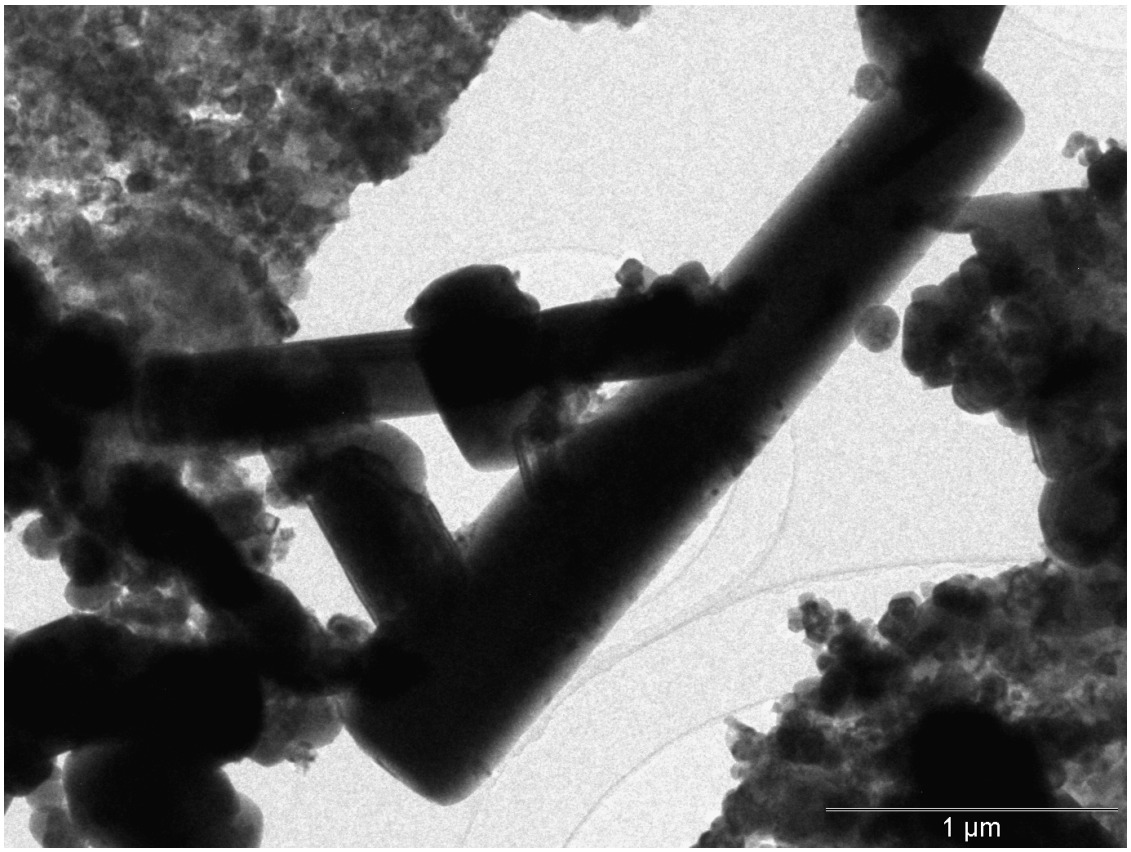


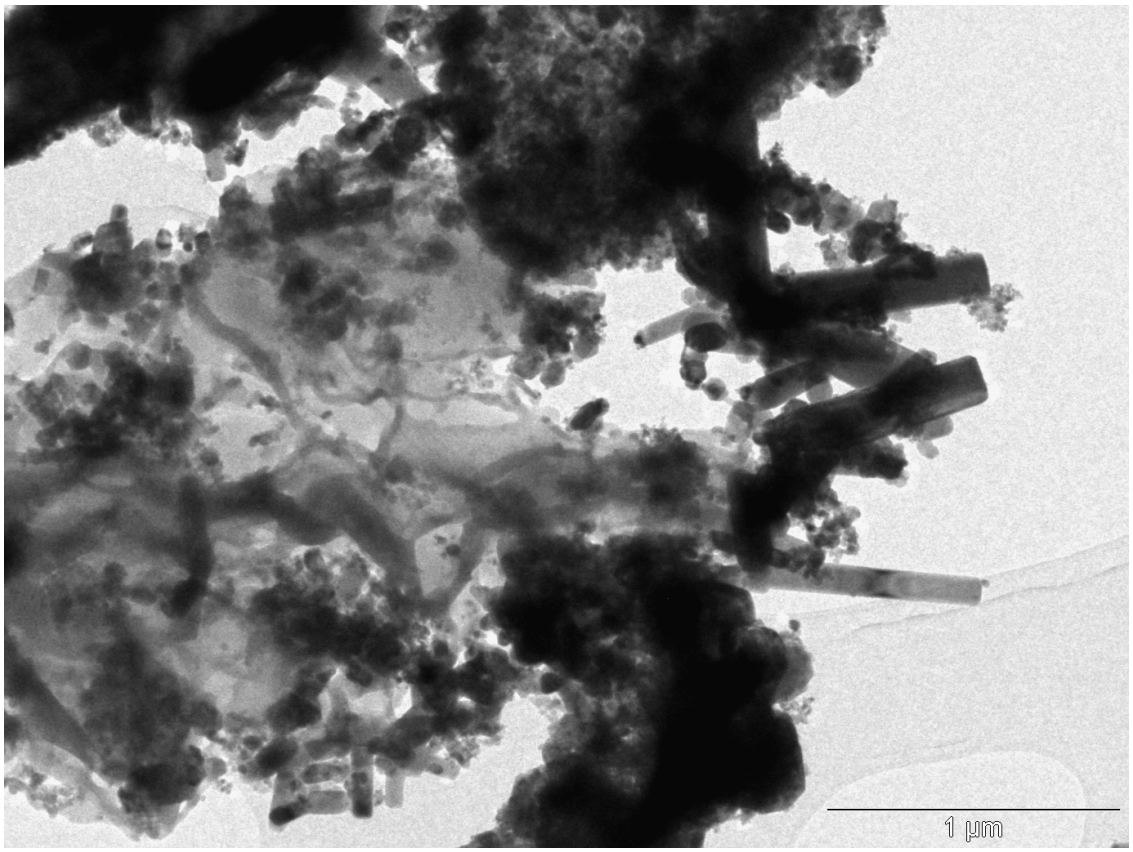
ZnO 1:2 ex. Agar





ZnO 1:2 alginic acid



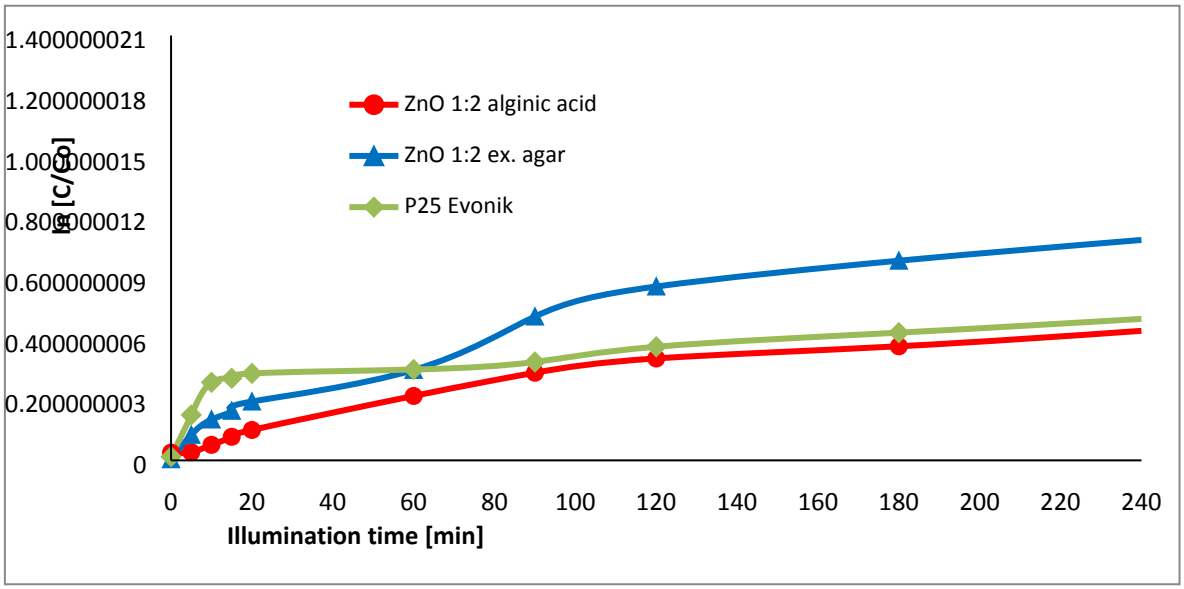


ZnO 1:2 starch

Photocatalytic experiments

As shown in Fig. 2 and 3 it is obvious that ZnO 1:2 ex. agar sample possesses the highest activity (52% for removal rate and 0.0072 min^{-1} for rate constant) for degrading phenol. To verify the percentage of phenol degradation (D%) are summarized in Table 1 of the manuscript.

The lowest degradation of phenol was 35% (for 240 min exposure).



Dependence of $\ln(C_0/C)$ on illumination time.