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Electronic Supplementary Information

Investigating the formation of diverse ZnO nanostructures based on solvent, temperature, and pH as adjustable parameters

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Section-S1: Lattice parameters of as-synthesized ZnO nanostructures

Table S1. Lattice parameters for ZnO nanostructures (**ZnO-1** to **ZnO-5**).

Sample	hkl	2θ values (degrees)	Lattice constants a, b, c (Å)	Volume of unit cell (Å^3)	APF	d spacings (Å)
ZnO-1	(100)	31.49	a = b = 3.28, c = 5.26	49.11	0.755	2.84
	(002)	34.13				2.63
	(101)	35.95				2.50
ZnO-2	(100)	31.51	a = b = 3.28, c = 5.25	49.10	0.755	2.84
	(002)	34.14				2.62
	(101)	36.04				2.49
ZnO-3	(100)	31.45	a = b = 3.28, c = 5.26	49.23	0.755	2.84
	(002)	34.11				2.63
	(101)	35.94				2.50
ZnO-4	(100)	31.46	a = b = 3.28, c = 5.25	49.17	0.755	2.84
	(002)	34.16				2.62
	(101)	35.95				2.50
ZnO-5	(100)	31.46	a = b = 3.28, c = 5.25	49.16	0.755	2.84
	(002)	34.14				2.62
	(101)	35.97				2.50

Table S2. Lattice parameters for ZnO nanostructures (**ZnO-6** to **ZnO-13**).

Sample	h k l	2θ values (degrees)	Lattice constants a, b, c (Å)	Volume of unit cell (Å^3)	APF	d spacing (Å)	FWHM
ZnO-6	(100)	31.44	a = b = 3.29,	49.41	0.755	2.85	0.492
	(002)	34.11	c = 5.26			2.63	
	(101)	35.94				2.50	
ZnO-7	(100)	31.42	a = b = 3.29,	49.52	0.755	2.85	0.491
	(002)	34.07	c = 5.27			2.63	
	(101)	35.91				2.50	
ZnO-8	(100)	31.40	a = b = 3.29,	49.61	0.755	2.85	0.338
	(002)	34.05	c = 5.27			2.63	
	(101)	35.87				2.51	
ZnO-9	(100)	31.40	a = b = 3.29,	49.60	0.755	2.85	0.334
	(002)	34.06	c = 5.27			2.63	
	(101)	35.89				2.51	
ZnO-10	(100)	31.41	a = b = 3.29,	49.58	0.755	2.85	0.311
	(002)	34.06	c = 5.27			2.63	
	(101)	35.89				2.50	
ZnO-11	(100)	31.54	a = b = 3.28,	48.97	0.755	2.85	0.358
	(002)	34.19	c = 5.25			2.63	
	(101)	36.02				2.50	
ZnO-12	(100)	31.44	a = b = 3.29,	49.40	0.755	2.85	0.265
	(002)	34.10	c = 5.26			2.63	
	(101)	35.93				2.50	
ZnO-13	(100)	31.41	a = b = 3.29,	49.53	0.755	2.85	0.258
	(002)	34.07	c = 5.27			2.63	
	(101)	35.90				2.50	

Table S3. Lattice parameters for ZnO nanostructures (**ZnO-14h** to **ZnO-17h**).

Sample	h k l	2θ values (degrees)	Lattice constants a, b, c (Å)	Volume of unit cell (Å^3)	APF	d spacings (Å)
ZnO-14h	(100)	31.69	a = b = 3.26,	48.07	0.754	2.82
	(002)	34.45	c = 5.22			2.61
	(101)	36.23				2.48
ZnO-15h	(100)	31.74	a = b = 3.26,	48.08	0.755	2.82
	(002)	34.44	c = 5.22			2.61
	(101)	36.22				2.48
ZnO-16h	(100)	31.74	a = b = 3.25,	48.14	0.755	2.82
	(002)	34.42	c = 5.20			2.61
	(101)	36.21				2.48
ZnO-17h	(100)	31.73	a = b = 3.25,	48.14	0.755	2.82
	(002)	34.42	c = 5.20			2.61
	(101)	36.23				2.48

Section S-2: Band Gap values of ZnO nanostructures

Table S4. Band gap values of as-synthesized ZnO nanostructures in different solvents

Sample	Band Gap (E_g) (eV)
ZnO-1	3.17
ZnO-2	3.11
ZnO-3	3.08
ZnO-4	3.01
ZnO-5	3.06

Table S5. Band gap values of as-synthesized ZnO nanoflowers at different temperatures

Sample	Band Gap (E_g) (eV)
ZnO-6	3.14
ZnO-7	3.15
ZnO-8	3.16
ZnO-9	3.17
ZnO-10	3.10
ZnO-11	3.15
ZnO-12	3.16
ZnO-13	3.17

Section-S3: TEM images of ZnO nanostructures (ZnO-9 and ZnO-12)

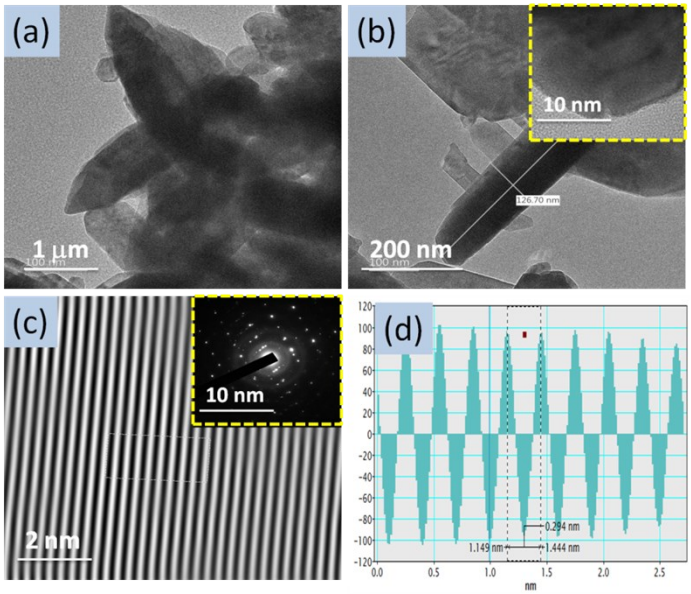

Fig. S1 (a) TEM image at 1 µm (b) TEM image at 200 nm (inset: HRTEM image at 10 nm), (c) Lattice fringe (inset: SAED pattern) and (d) d-spacing average of **ZnO-9**.

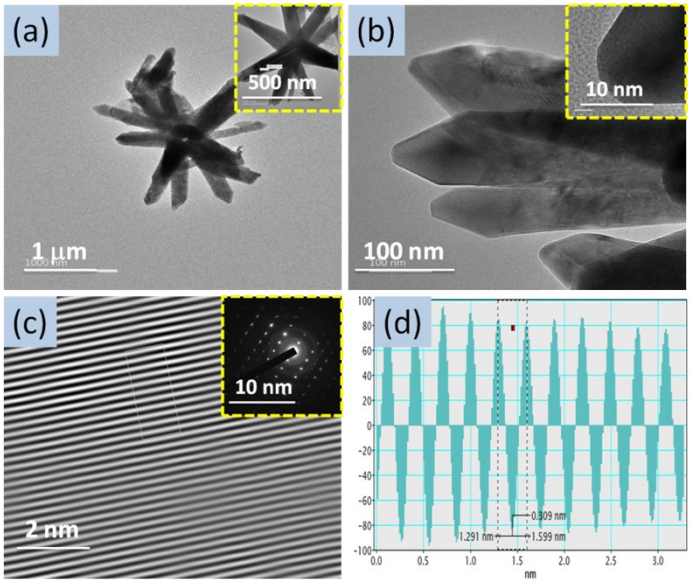

Fig. S2 (a) TEM image at 1 µm (inset: TEM image at 500 nm), (b) TEM image at 100 nm (inset: HRTEM image at 10 nm), (c) Lattice fringe (inset: SAED pattern) and (d) d-spacing average of **ZnO-12**.

Section-S4: FESEM images of ZnO nanostructures (ZnO-15 to ZnO-17)

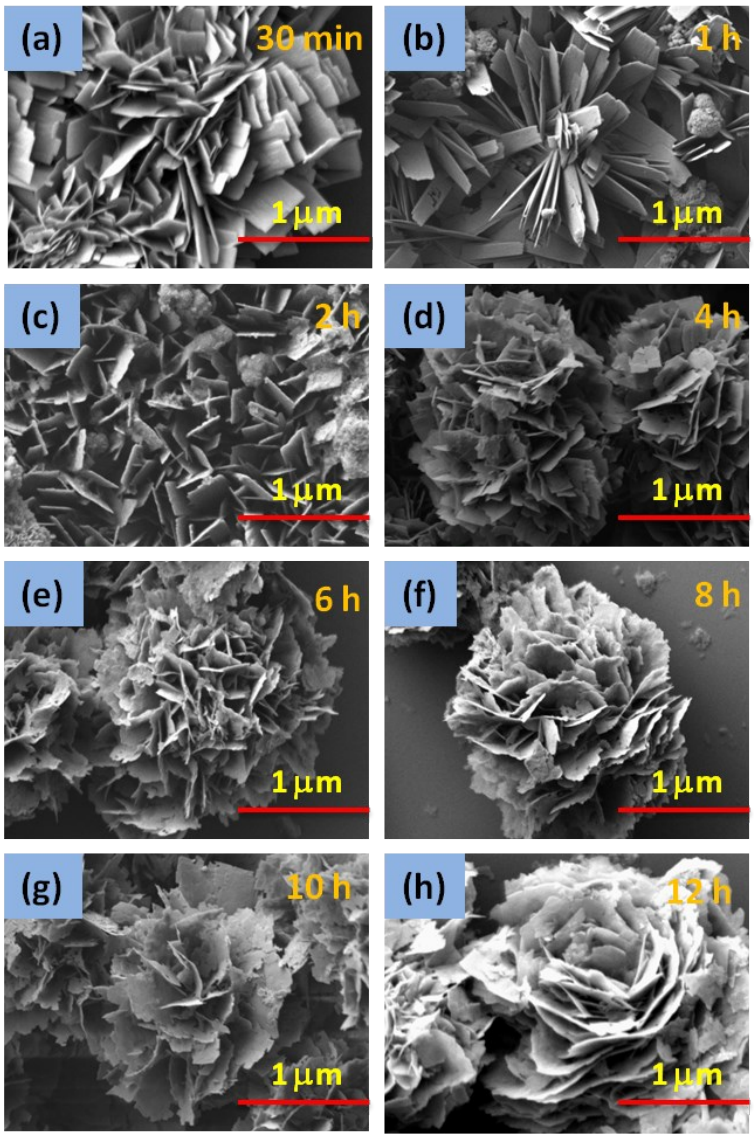

Fig. S3 (a-h) Formation of 3D ZnO nanoflowers (**ZnO-15** at pH = 10) assembled by nanosheets with a variation of growth time from 30 minutes to 12 hours.

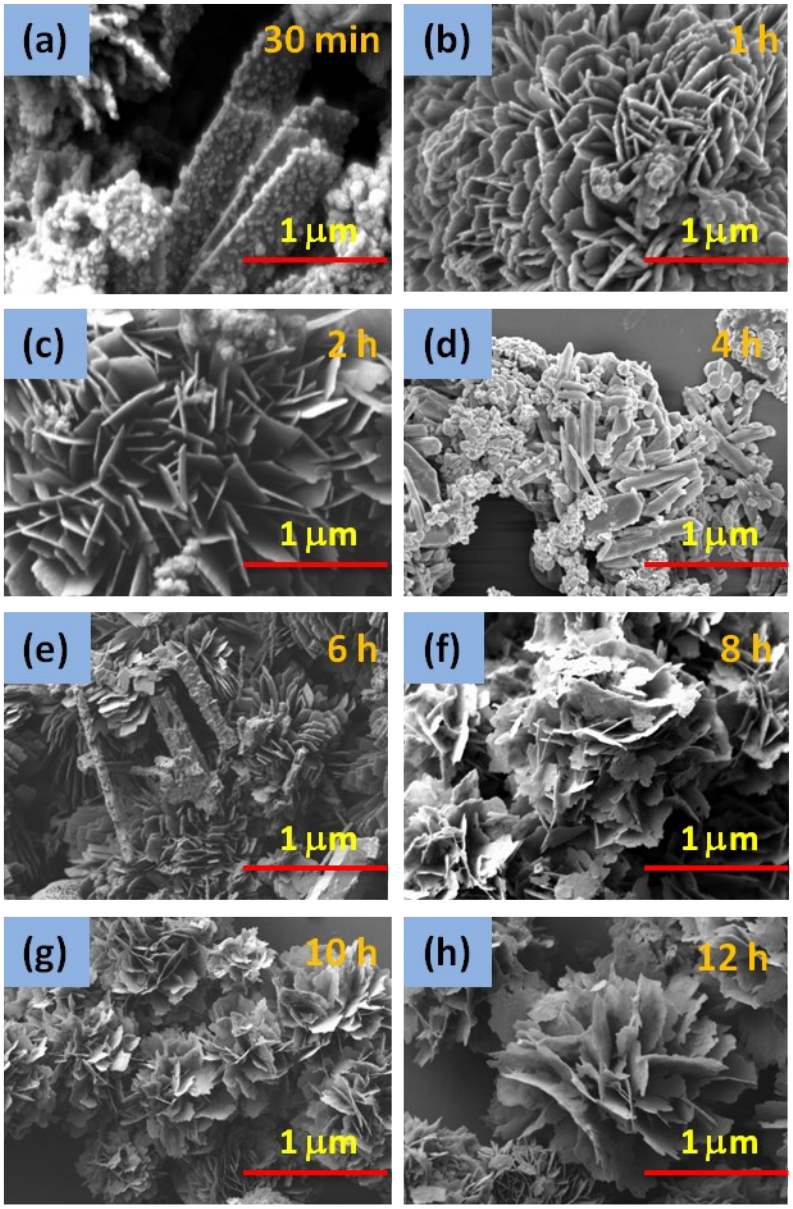

Fig. S4 (a-h) Formation of 3D ZnO nanoflowers (**ZnO-16** at pH = 11) assembled by nanosheets with a variation of growth time from 30 minutes to 12 hours.

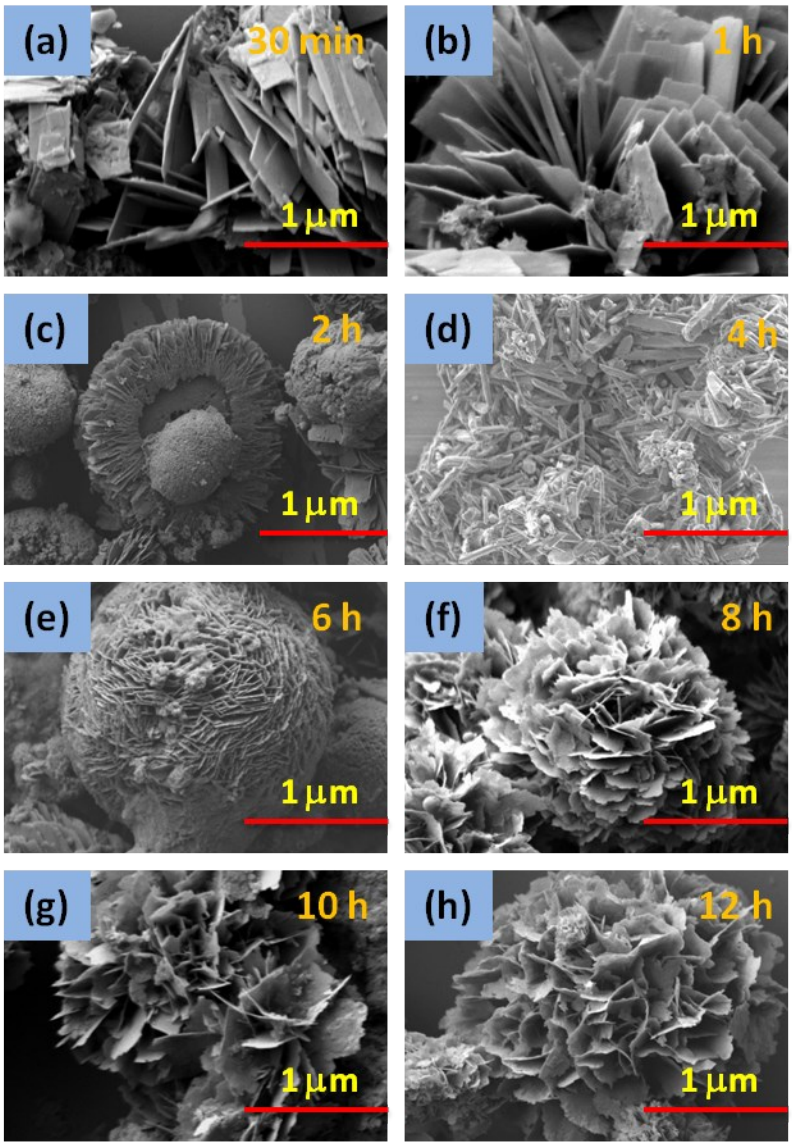

Fig. S5 (a-h) Formation of 3D ZnO nanoflowers (**ZnO-17** at pH = 12) assembled by nanosheets with a variation of growth time from 30 minutes to 12 hours.