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Supporting Information

Pathway of Zinc Oxide Formation by Seed-Assisted and Controlled Double-Jet Precipitation

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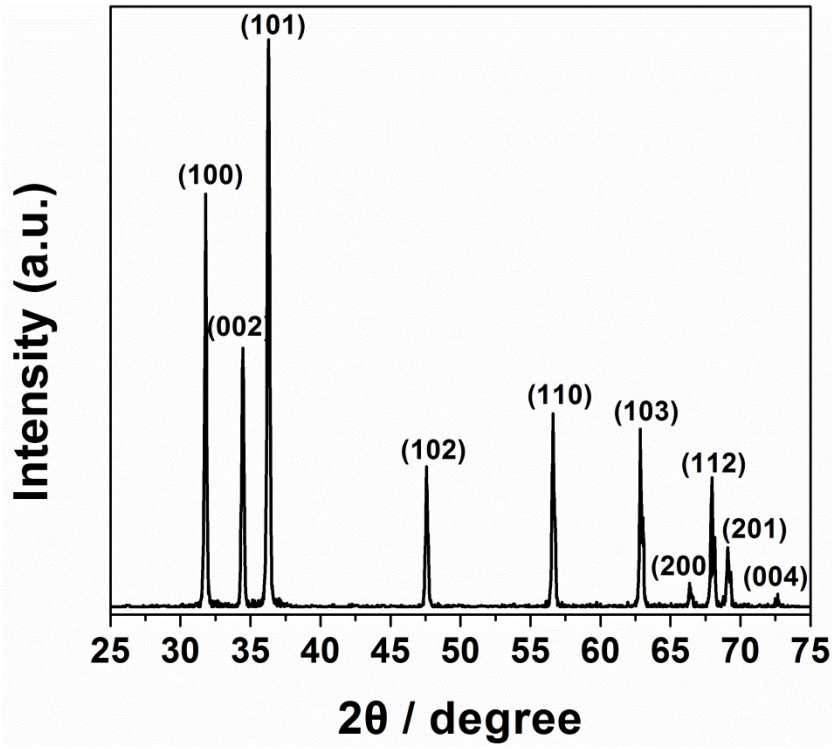

Figure S1 XRD pattern of ZnO seeds

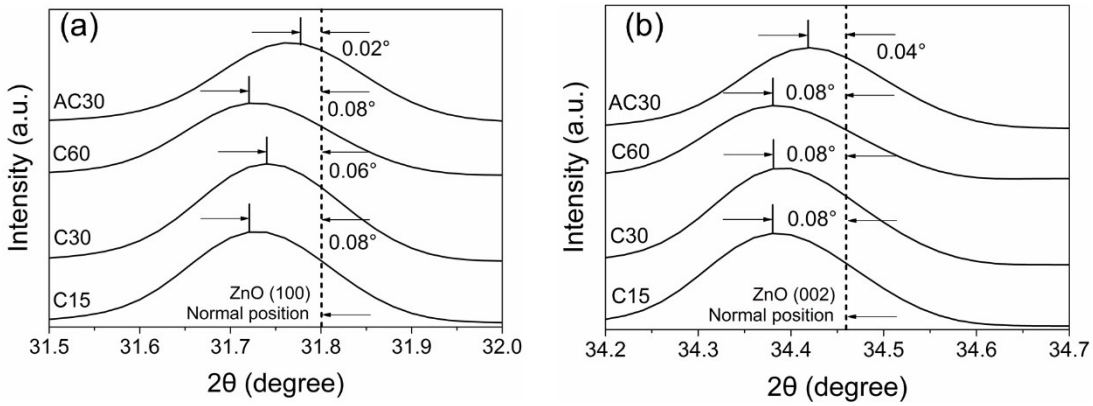

Figure S2 Enlarged ZnO (100) (a) and (002) (b) diffraction peaks of samples

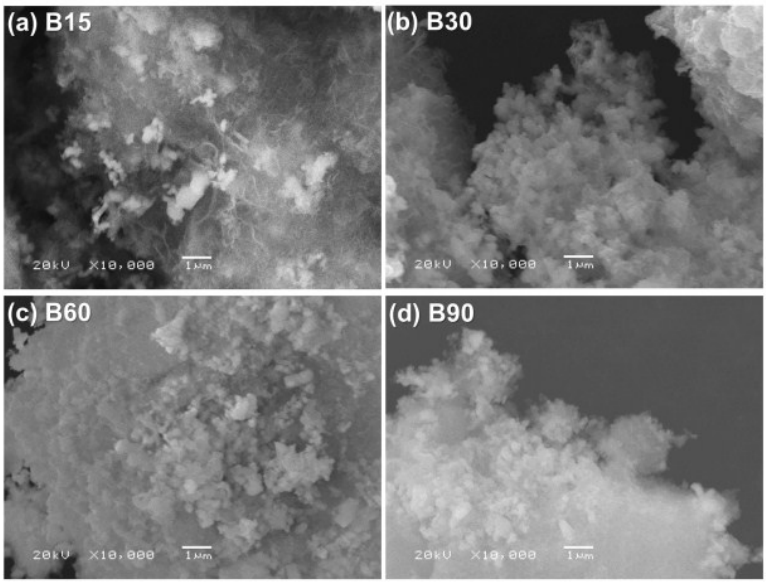

Figure S3 SEM images of control samples

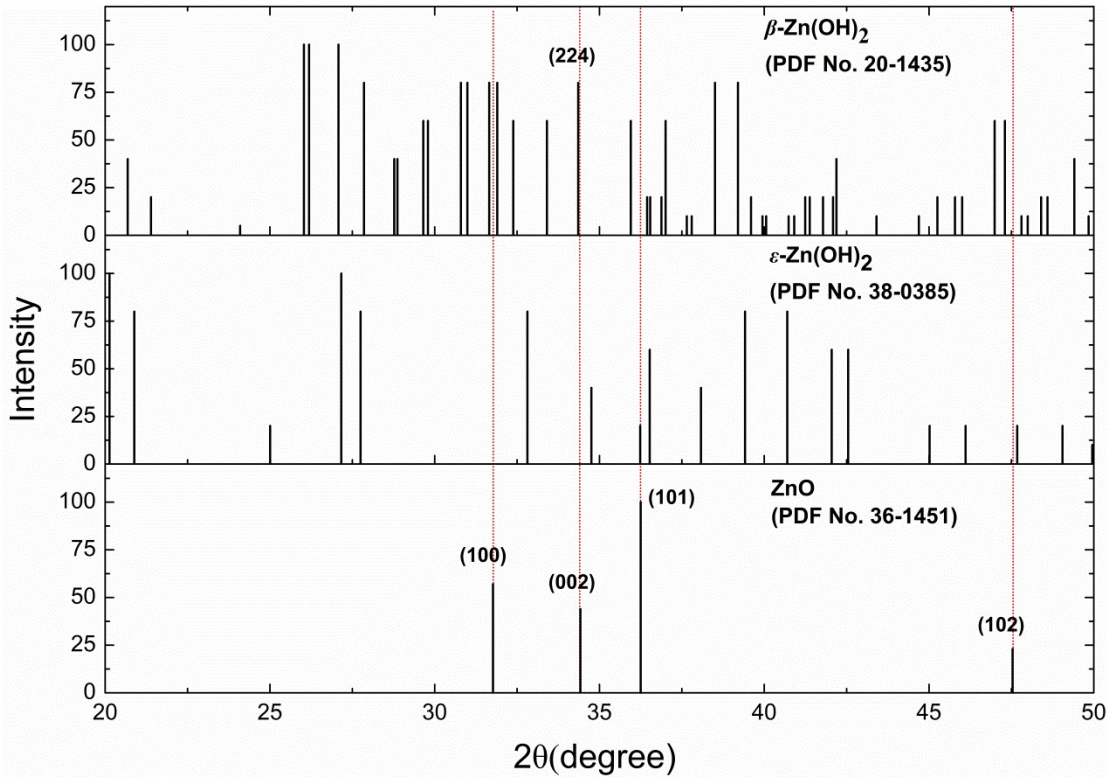

Figure S4 Reference XRD patterns for ZnO, ε-$Zn(OH)_2$, and β-$Zn(OH)_2$

Table S1 Thermodynamic data of Zn-OH species (1 atm, 25 ℃)

Species	$\Delta_f G^o$ (kJ mol^{-1})	$\Delta_f H^o$ (kJ mol^{-1})	S^o (J deg^{-1} mol^{-1})
H_2O [a]	-237.14	-285.83	69.95
OH^- [a]	-157.28	-230.02	-10.90
Zn^{2+} [a]	-147.10	-153.39	-109.8
ZnO (cr) [a]	-320.52	-350.46	43.65
ε-$Zn(OH)_2$ (cr) [a]	-555.13	-639.06	81.59
β-$Zn(OH)_2$ (cr) [a]	-553.17	-641.91	81.17

[a] Quoted from Ref. [1]

Table S2 Thermodynamic data of reaction for ZnO formation (1 atm, 25 ℃)

No.	Reaction	$\Delta_r G^o$ (kJ mol^{-1})	$\Delta_r H^o$ (kJ mol^{-1})	$\Delta_r S^o$ (J deg^{-1} mol^{-1})
1	$Zn^{2+} + 2OH^- = \varepsilon$-$Zn(OH)_2$ (cr) [a]	-93.47 (-59.45 [b])	-25.63	213.19
2	$Zn^{2+} + 2OH^- = \beta$-$Zn(OH)_2$ (cr) [a]	-91.51 (-57.49 [b])	-28.48	212.77
3	ε-$Zn(OH)_2$ (cr) = β-$Zn(OH)_2$ (cr)	1.96	-2.85	-0.42
4	ε-$Zn(OH)_2$ (cr) = ZnO (cr) + H_2O	-2.53	2.77	32.01
5	β-$Zn(OH)_2$ (cr) = ZnO (cr) + H_2O	-4.49	5.62	32.43

[a] $K_{sp}=3.5\times10^{-17}$ at 25 ℃ [2]

[b] Data calculated under the state that the first drop of Zn^{2+} solution was added.

References

1. J. A. Dean, *Lange's Handbook of Chemistry*, McGraw-Hill, New York, 1979.
2. A. Moezzi, M. Cortie and A. McDonagh, *Dalton T.*, 2011, **40**, 4871.