Electronic Supplementary Information

Micro- and nanostructured layered-kagome zinc orthovanadate $BaZn_3(VO_4)_2(OH)_2$

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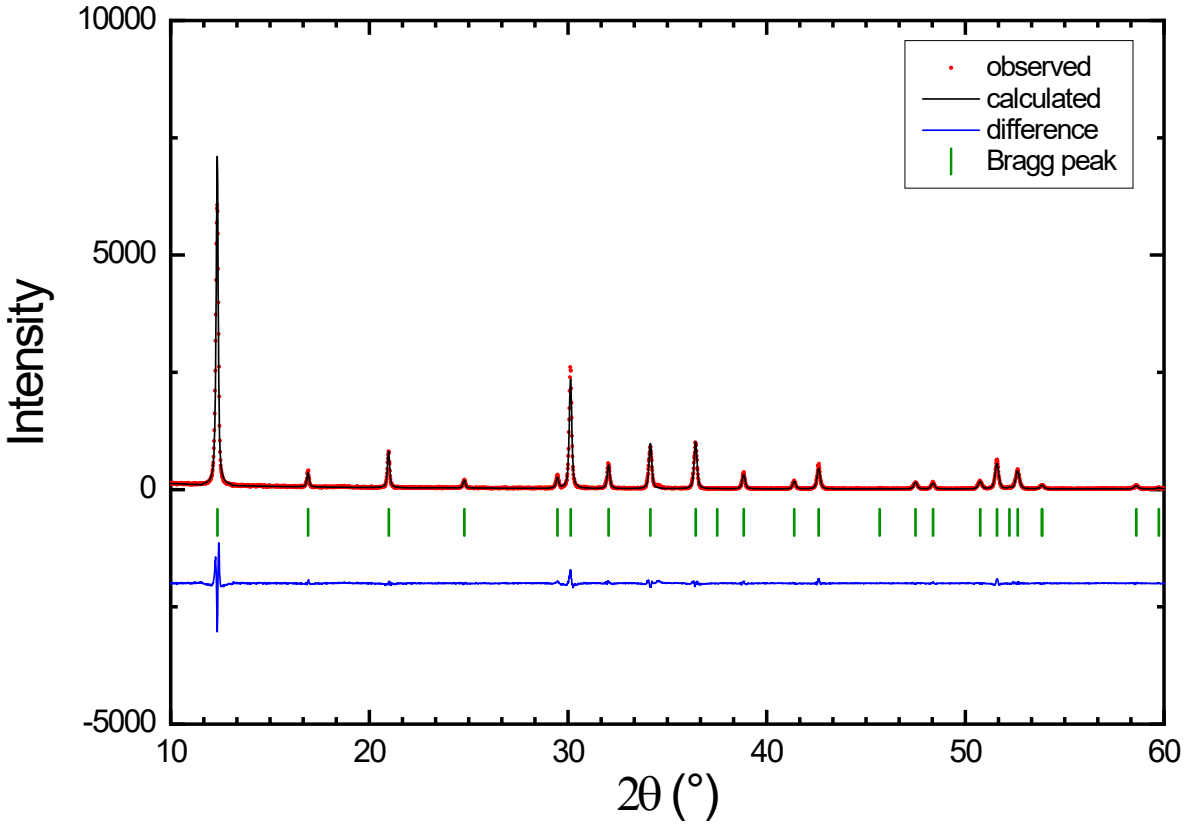

Figure S1. Portion of the Rietveld refinement plot for $Zn_3V_2O_7(OH)_2{\cdot}2H_2O$ showing observed, calculated and difference patterns. Data were taken and refined from 2θ = 10° to 2θ = 90°.

Table S1. Structural parameters, crystallite size, and final agreement factors for $Zn_3V_2O_7(OH)_2{\cdot}2H_2O$ derived from our Rietveld refinement.

S.G ($P\bar{3}m$): a (Å) = 6.0698(2), c (Å) = 7.1986(5), Cryst. Size = 109(2) nm					
Atom	x	y	z	SOF	U_{iso} Equiv (Å^2)
Zn_1	1/2	0	0	1	0.031(2)
V_1	0	0	0.2506(8)	1	0.019(2)
O_1	2/3	1/3	0.878(3)	1	0.023(4)
O_2	0.1533(13)	0.307(3)	0.826 (2)	1	0.023
O_3	0	0	1/2	1	0.023
O_4	0.733(6)	0.367(3)	0.498(11)	0.333	0.023
H_1	2/3	1/3	0.75*	1	0.07599*
GOF = 1.4, Rwp = 15.73, and Rp = 11.73					

*not refined

ADP harmonic parameters

Aniso. ADP (Å^2)	U_{11}	U_{22}	U_{33}	U_{12}	U_{13}	U_{23}
Zn_1	0.031(3)	0.025(4)	0.035(3)	0.012(2)	0.008(4)	0.016(8)
V_1	0.020(3)	0.020	0.017(4)	0.010(2)	0	0

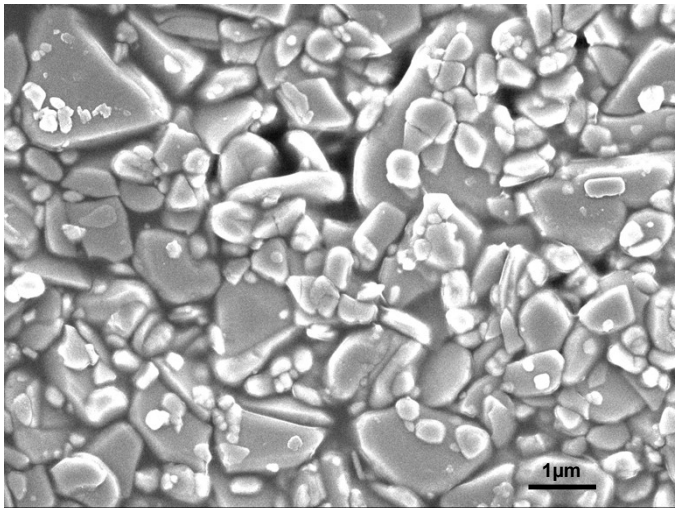

Figure S2. SEM image of $Zn_3V_2O_7(OH)_2{\cdot}2H_2O$.

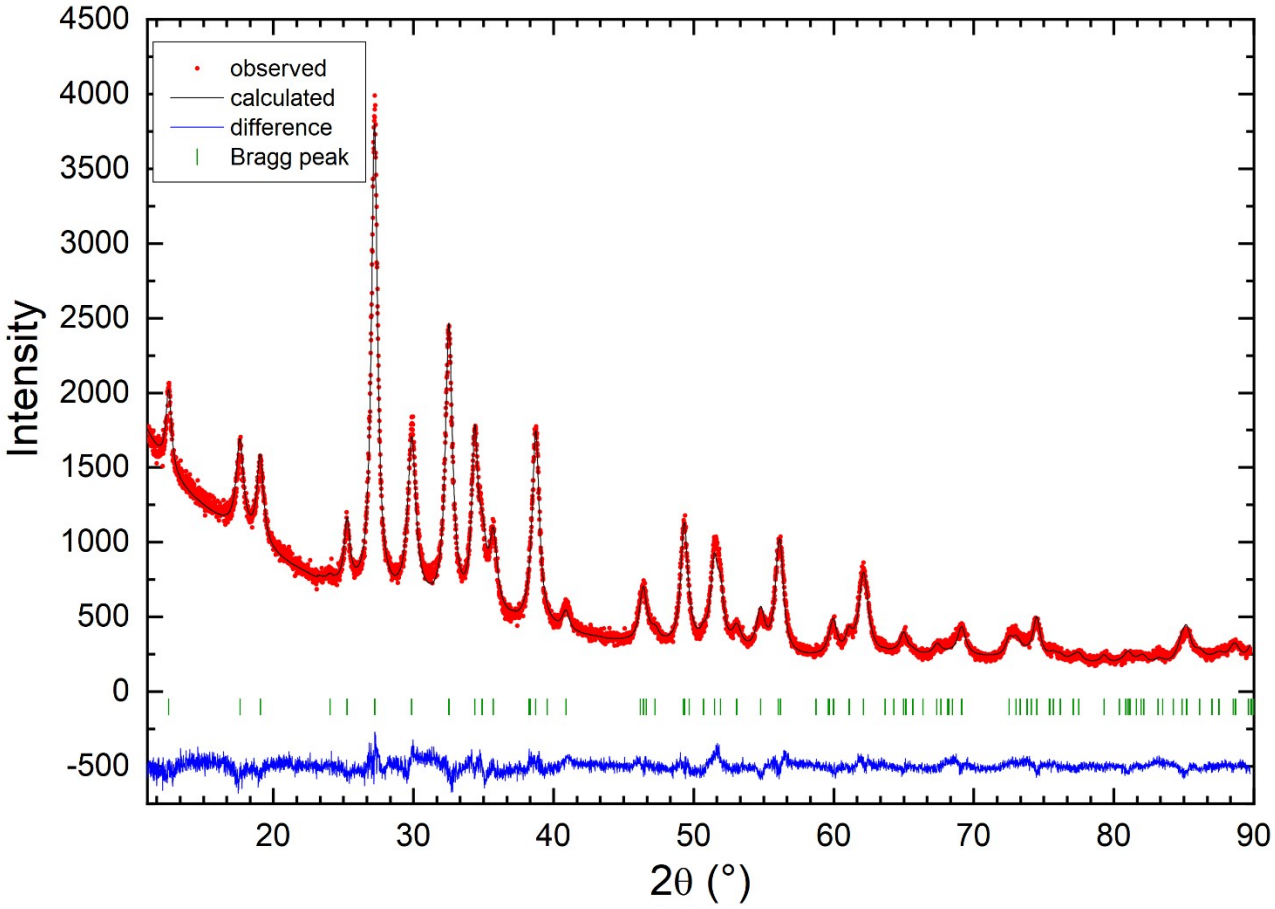

Figure S3. Rietveld refinement plot for **$BaZn_3$ NPs-25min** showing observed, calculated and difference patterns.

Table S2. Structural parameters, crystallite sizes, and final agreement factors for **$BaZn_3$ NPs-7h**.

S.G ($R\bar{3}m$): a (Å) = 5.9608(5), c (Å) = 21.062(2), Cryst. Size = 26.0(8) nm // [001], 37(2) nm ⊥ [001]					
	x	y	z	SOF	U_{iso}
Ba_1	2/3	1/3	5/6	1	0.042(3)
Zn_1	5/6	2/3	2/3	1	0.040(4)
V_1	1/3	2/3	0.7561(4)	1	0.011(4)
O_1	1/3	2/3	0.8347(12)	1	0.007(4)
O_2	0.493(2)	0.507(2)	0.7322(6)	1	0.007
O_3	1	1	0.704(2)	1	0.007
H_1	1	1	0.7494*	1	0.008*
GOF = 2.28, Rwp = 4.05, and Rp = 2.73					

*not refined

ADP harmonic parameters

	U_{11}	U_{22}	U_{33}	U_{12}	U_{13}	U_{23}
Ba_1	0.051(4)	0.051	0.023(5)	0.026(2)	0	0
Zn_1	0.044(4)	0.053(5)	0.026(6)	0.027(2)	0.004(2)	0.008(4)
V_1	0.005(4)	0.005	0.023(7)	0.003(2)	0	0

Table S3. Structural parameters, crystallite sizes, and final agreement factors for **$BaZn_3$ NPs-25 min**.

S.G ($R\bar{3}m$): a (Å) = 5.9675(10), c (Å) = 21.100(4), Cryst. Size = 13.1(4) nm // [001], 19.3(1) nm ⊥ [001]					
	x	y	z	SOF	U_{iso}
Ba_1	2/3	1/3	5/6	1	0.069(4)
Zn_1	5/6	2/3	2/3	1	0.070(4)
V_1	1/3	2/3	0.7574(5)	1	0.016(4)
O_1	1/3	2/3	0.8411(13)	1	0.019(4)
O_2	0.490(2)	0.510(2)	0.7324(7)	1	0.019
O_3	1	1	0.709(2)	1	0.019
H_1	1	1	0.7494*	1	0.008*
GOF = 1.38, Rwp = 4.86, and Rp = 3.58					

*not refined

ADP harmonic parameters

	U_{11}	U_{22}	U_{33}	U_{12}	U_{13}	U_{23}
Ba_1	0.094(6)	0.094	0.021(6)	0.047(3)	0	0
Zn_1	0.075(5)	0.099(6)	0.044(8)	0.049(3)	0.014(3)	0.028(5)
V_1	0.004(5)	0.004	0.039(9)	0.002(2)	0	0

Table S4. Main M-O (M = Ba, Zn, and V) bond distances (Å) and O-V-O angles for **$BaZn_3$ MPs**, **$BaZn_3$ NPs-7h** and **$BaZn_3$ NPs-25min**.

$BaZn_3$ MPs	**$BaZn_3$ NPs-25min**	**$BaZn_3$ NPs-7h**
Ba1—O2 (x 6): 2.811(10) Ba1—O1 (x 4): 3.4488(3) Ba1—O1 (x 2): 3.4488(2) Mean: 3.13±0.02	Ba1—O2 (x 6): 2.81(2) Ba1—O1 (x 4): 3.449(2) Ba1—O1 (x 2): 3.4492(14) Mean: 3.13±0.03	Ba1—O2 (x 6): 2.786(12) Ba1—O1 (x 4): 3.4416(9) Ba1—O1 (x 2): 3.4416(4) Mean: 3.11±0.02
Zn1—O2 (x 2): 2.233(8) Zn1—O2 (x 2): 2.233(12) Zn1—O3 (x 2): 1.948(11) Mean: 2.14 ± 0.03	Zn1—O2 (x 2): 2.26(2) Zn1—O2 (x 2): 2.255(12) Zn1—O3 (x 2): 1.94(2) Mean: 2.15 ± 0.05	Zn1—O2 (x 2): 2.235(10) Zn1—O2 (x 2): 2.235(13) Zn1—O3 (x 2): 1.893(13) Mean: 2.12 ± 0.04
V1—O1: 1.67(2) V1—O2 (x 3): 1.706(11) Mean: 1.70 ± 0.04 Angles: O1—V1—O2 (x 3): 107.5(4)° O2—V1—O2 (x 3): 111.4(6)°	V1—O1: 1.77(3) V1—O2 (x 3): 1.701(14) Mean: 1.72 ± 0.05 Angles: O1—V1—O2 (x 3):108.0(6)° O2—V1—O2 (x 3): 110.9(7)°	V1—O1: 1.65(3) V1—O2 (x 3): 1.722(11) Mean: 1.70 ± 0.05 Angles: O1—V1—O2 (x 3): 107.0(5)° O2—V1—O2 (x 3): 111.8(5)°

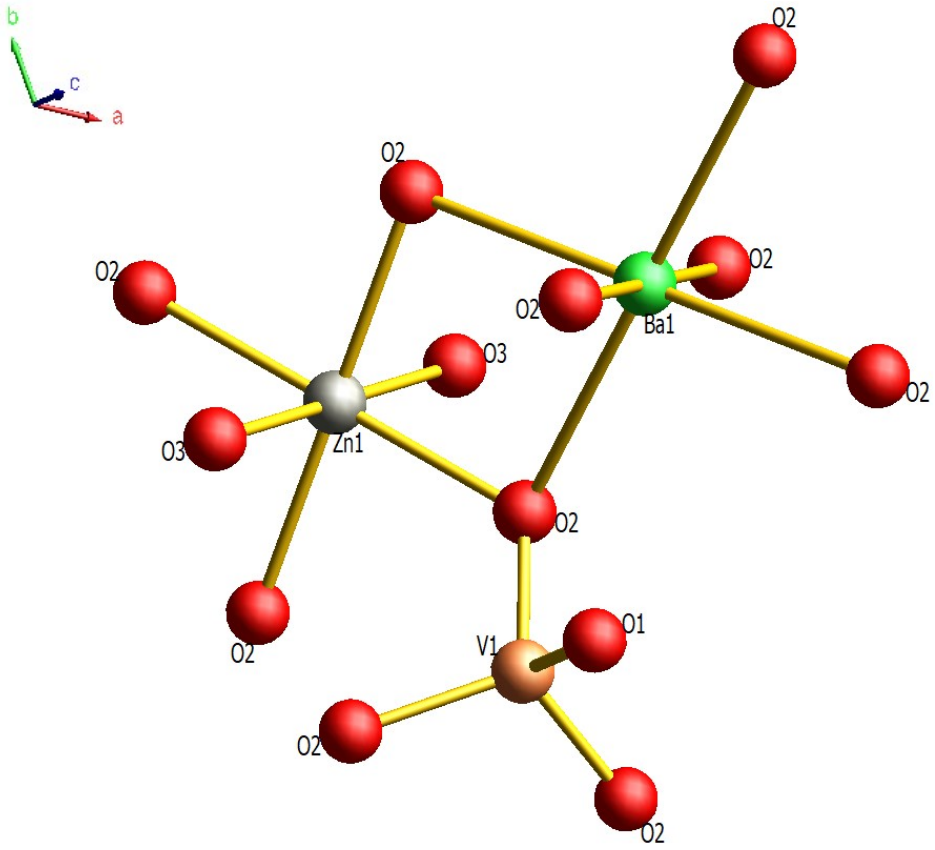
b
c
a
O2
O2
O2
O2
O2
Ba1
O2
O3
O3
Zn1
O2
O2
O1
V1
O2
O2

Figure S4. Ball and stick model showing MO_x polyhedra (M = Ba, Zn, and V) in the crystal structure of $BaZn_3(VO_4)_2(OH)_2$. The six long Ba—O1 distances are not visualized for the sake of clarity.

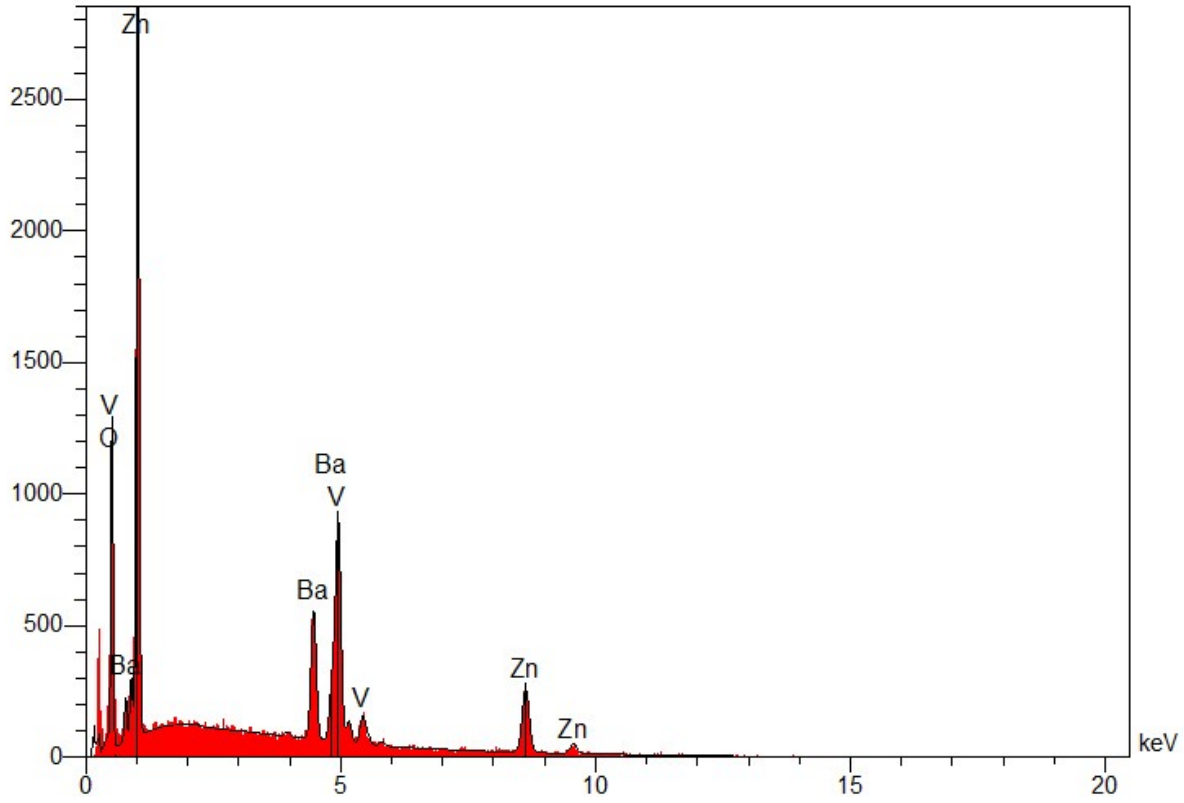

Figure S5. SEM-EDS spectrum acquired on **$BaZn_3$ MPs**.

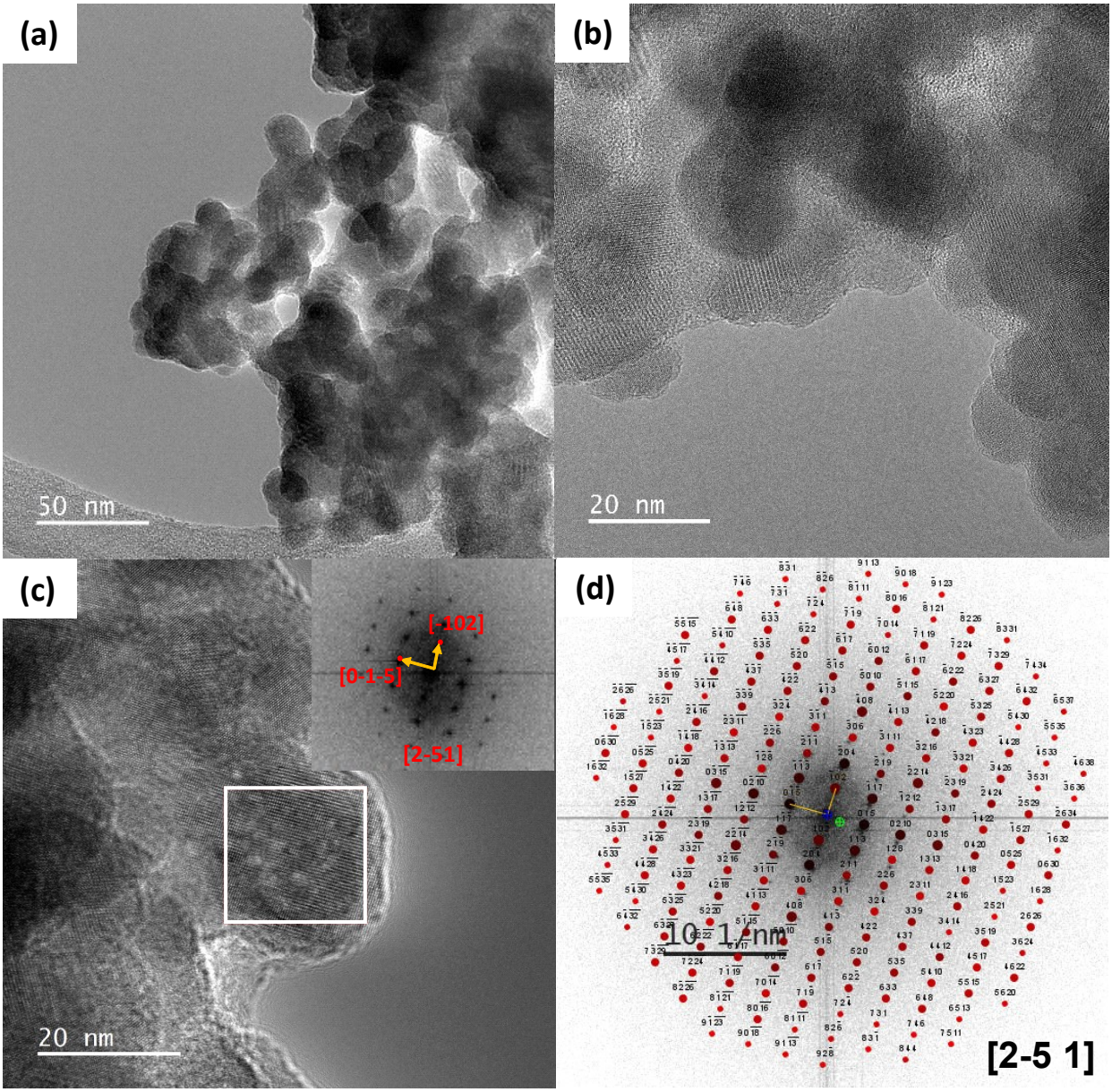

Figure S6. (a, b) TEM images of representative **$BaZn_3$ NPs-25min** at different magnifications. Reticular planes are visible in (b). (c, d) FFT diffraction pattern along the [2-51] zone axis from the region marked out by the white rectangle in (c). Global indexing in (d) was obtained using the structural model deduced from XRD (Table S3).

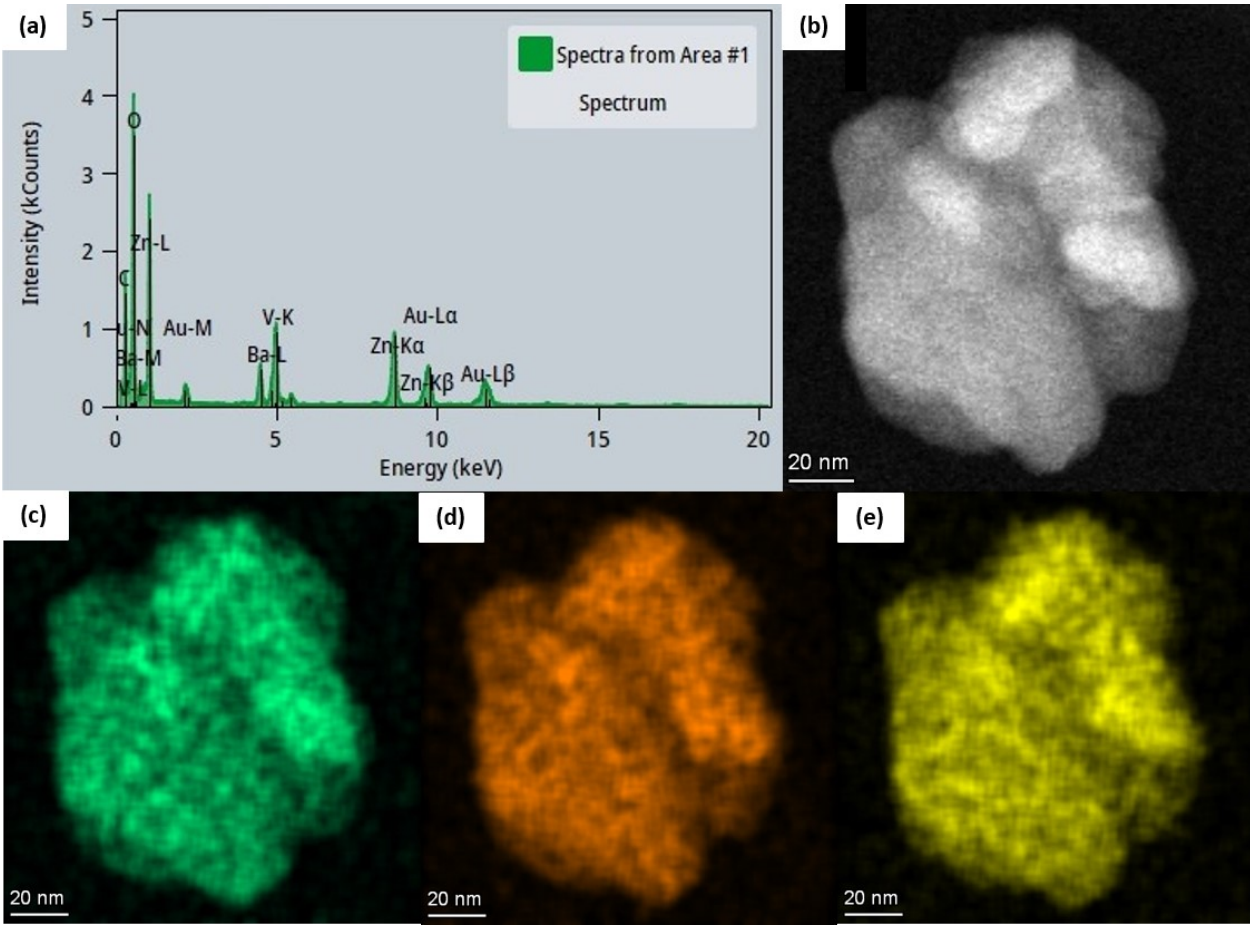

Figure S7. (a) EDS spectrum of the chosen particle of **$BaZn_3$ NPs-7h** displayed in (b). (c,d,e) EDS mapping analysis of Ba, Zn and V elements, respectively.

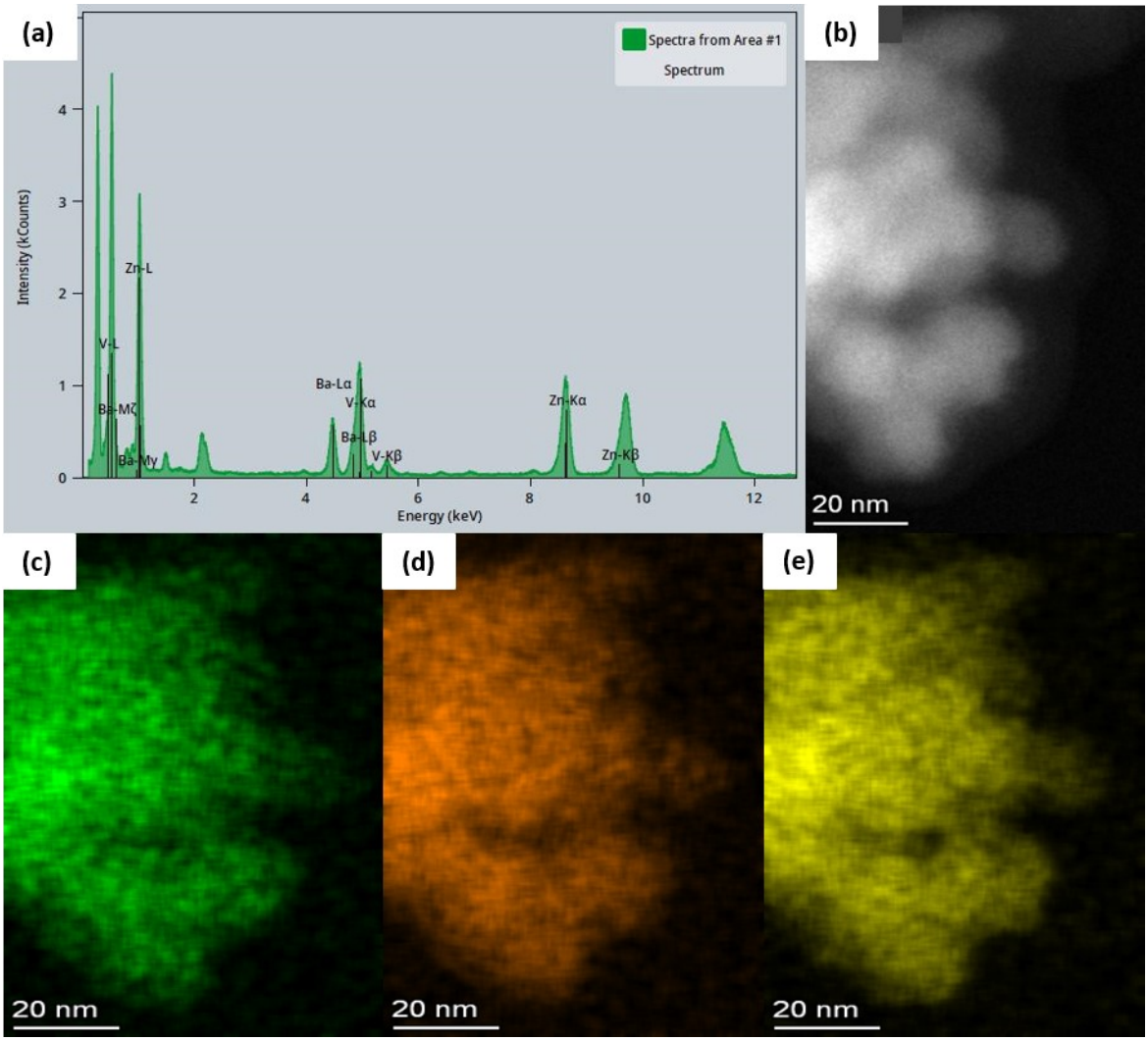

Figure S8. (a) EDS spectrum of the chosen particle of **$BaZn_3$ NPs-25min** displayed in (b). (c,d,e) EDS mapping analysis of Ba, Zn and V elements, respectively.