Supplementary Information

Turning-on Persistent Luminescence out of Chromium-Doped Zinc Aluminate Nanoparticles by Instilling Antisite Defect under Mild Conditions

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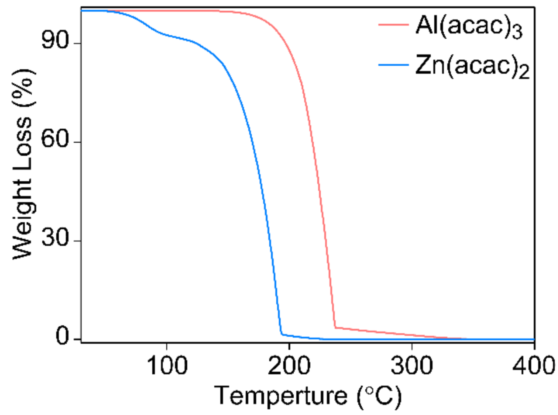

Fig S1. Thermal gravity curves of $Al(acac)_3$ and $Zn(acac)_3$.

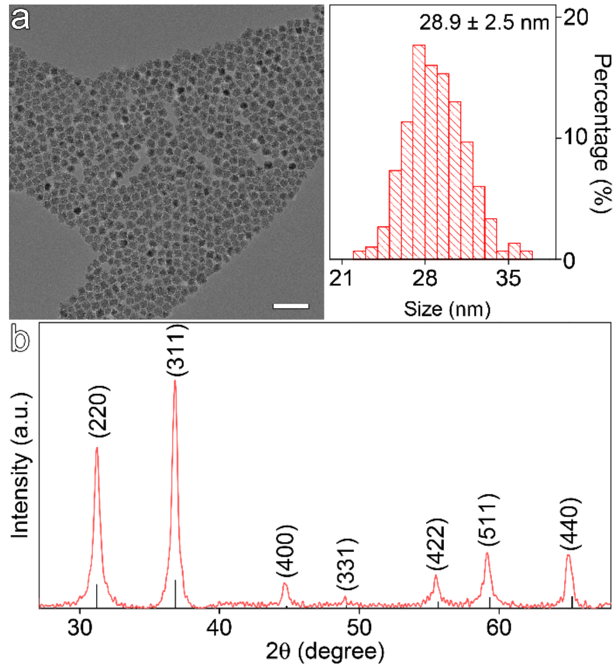

Fig S2. TEM image together with the corresponding particle size histogram of ZAC-5 nanoparticles prepared through a seed-mediated growth (the embedded scale bars correspond to 100 nm).

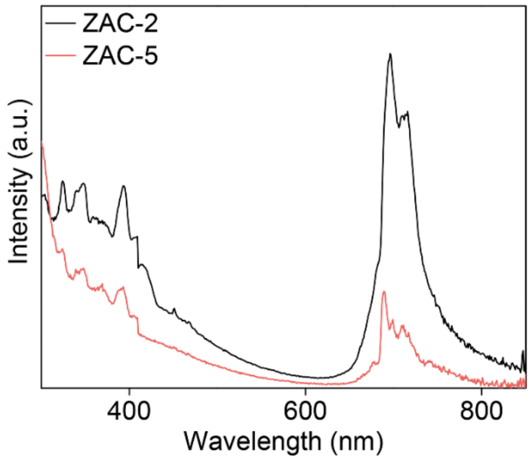

Fig S3. Photoluminescence spectra of ZAC-2 and ZAC-5 recorded under excitation at 254 nm with a Xe lamp.

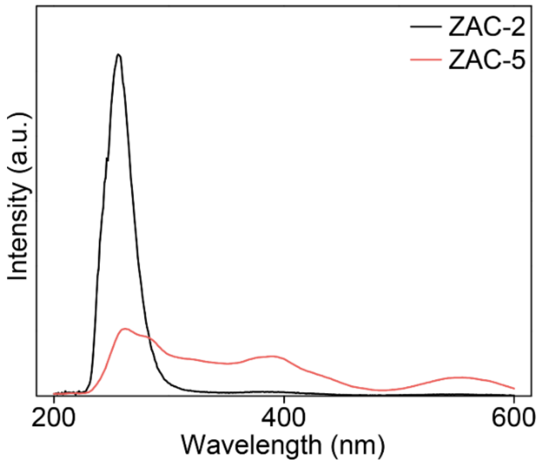

Fig S4. Fluorescence excitation spectra of ZAC-2 and ZAC-5 recorded under excitation at 254 nm with a Xe lamp.

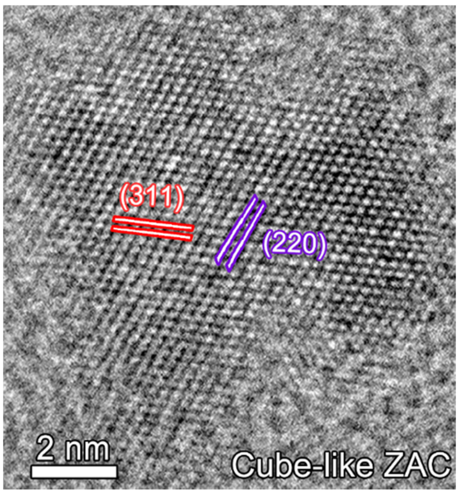

Fig S5. HRTEM image of ZAC-3 cube-like nanoparticles.

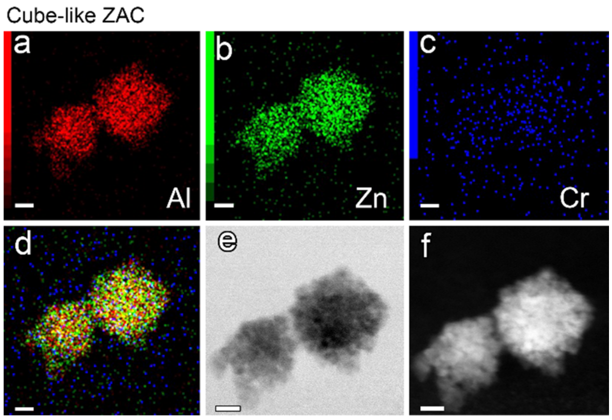

Fig S6. STEM-EDS elemental mapping of ZAC-5 nanoparticles (the embedded scale bars correspond to 10 nm).

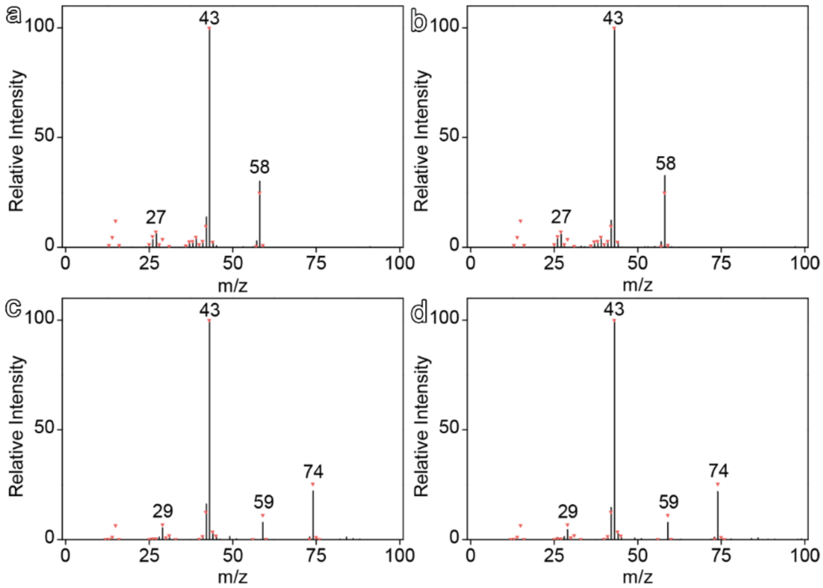

Fig S7. Mass spectra of the species collected at retention time of 1.45 min and 1.53 min, respectively, formed by methanol promoted decomposition of $Zn(acac)_2$ and $Al(acac)_3$.

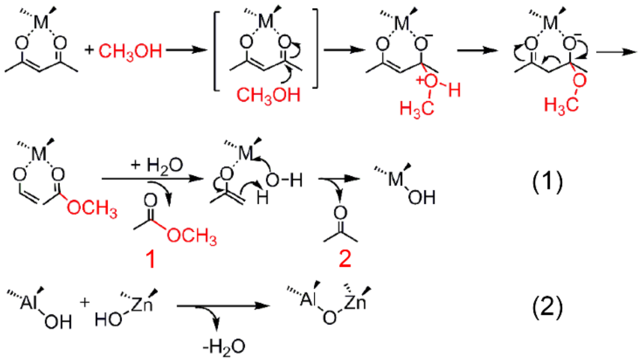

Fig S8. Mechanism of Al-O-Zn bond formation catalyzed by MeOH.

Table S1. The parameters for multi-exponentially fitting the decay curves in **Figure 2b**, *i.e.*, the normalized amplitude B_i, time constant τ_i, and their normalized products f_i.⊥

Sample	B_1 [%]	f_1 [%]	τ_1 [s]	B_2 [%]	f_2 [%]	τ_2 [s]	B_3 [%]	f_3 [%]	τ_3 [s]	B_4 [%]	f_4 [%]	τ_4 [s]	τ_{avg} [s]
ZAC-1	11.05	0.081	1.0	26.12	1.61	8.5	26.61	10.88	56.0	36.22	87.42	330.7	295.4
ZAC-2	27.9	0.78	3.2	31.45	8.8	31.8	40.65	90.40	252.5				231.1

⊥The PL decay curves were fitted using a multi - exponential function:

$$I(t) = \sum_{i=1}^{n} B_i \exp(-t/\tau_i),\ \sum_{i=1}^{n} B_i = 1$$

In this expression, τ_i represents the decay time constants, and B_i represents the normalized amplitude of each components, n is the number of decay times. Because the photoluminescence decays for most of the samples are best fitted using a three - /four - exponential model (n = 3/4), the amplitude weighted average decay lifetime (τ_{avg}) of the entire PL decay process was calculated with the following equation:

$$\tau_{avg} = \frac{\sum B_i \tau_i^2}{\sum B_i \tau_i}$$

Table S2. Texture coefficients (TC) of ZAC-1 and ZAC-2 nanoparticles calculated based on the XRD diffraction peak positions.

	(*hkl*)	TC
ZAC-1	(220)	1.05
	(311)	1.26
ZAC-2	(220)	1.11
	(311)	1.31