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Excitation energy dependent switchable emission in $SrZnO_2$ nanophosphors: XAS and luminescence studies

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Section S1:

When atom is provided with edge energy, the probability of dipole allowed transition of deep core electron of an atom *a* from ground state $|i>$ into higher unoccupied state $|f>$ as per Fermi's Golden rule is given as

$$\mu_a(E) \propto \sum_{f}^{E_f>E_F} |< f|\hat{\varepsilon}.\boldsymbol{r}|i >|^2 \delta(E - E_f) \quad \textbf{1}$$

The sum is over all energies greater than Fermi energy (E_F) and incident electromagnetic wave is interacting with material through dipole operator $\hat{\varepsilon}.\boldsymbol{r}$. Equation (1) can be rewritten by using one-electron propagator Green's function as

$$\mu_a(E) \propto -\frac{1}{\pi}|< i|\widehat{\varepsilon^*}.\boldsymbol{r}G(E)\hat{\varepsilon}.\boldsymbol{r}|i >|^2 \Theta(E - E_f) \quad \textbf{2}$$

where is Θ heaviside step function ensuring non-zero cross-section about E_F. Using Dyson equation and full atomic scattering matrix *T*, Taylor series expansion of one-electron propagator *G* is given as

$$G = G^0 + G^0 t G^0 + G^0 t G^0 t G^0 + \ldots.$$
$$G = (1 - G^0 t)^{-1} G^0 \quad \textbf{3}$$

The absorption cross section $\mu_a(\varepsilon)$, in terms of atomic background $\mu_0(\varepsilon)$ and multiple scattering fine structure function $\chi_l(\varepsilon)$, is given as

$$\mu_a(\varepsilon) = \mu_0(\varepsilon)[1 + \chi_l(\varepsilon)] \quad \textbf{4}$$

where *l* is final state angular momentum and relative energy is taken in terms of ε. Thus, XANES can be directly obtained from eq. (3) by inverting ($1\text{-}G^0t$) and multiplying by matrix G^0.

Table S1: Various colorimetric parameters corresponding to luminescence observed at 270 nm and 376 nm excitation in $SrZnO_2$ nanophosphors. The tabulated parameters are calculated from ColorCalculator software which is based on parameters standardized by Illumination Engineering Society (IES).

Parameters		**At 270 nm excitation**	**At 376 nm excitation**
Commission Internationale de I'Eclairage (CIE) coordinates		(0.1791, 0.1594)	(0.2875, 0.3914)
Luminescence efficacy ratio (LER)		129	324
Distance from black body locus (D_{uv})		-0.0614	0.0431
Color quality scale (CQS)		72	71
Television light consistency index (TLCI)		22	54
IES TM30-18 parameters	**R_f**	70	76
	R_g	87	80

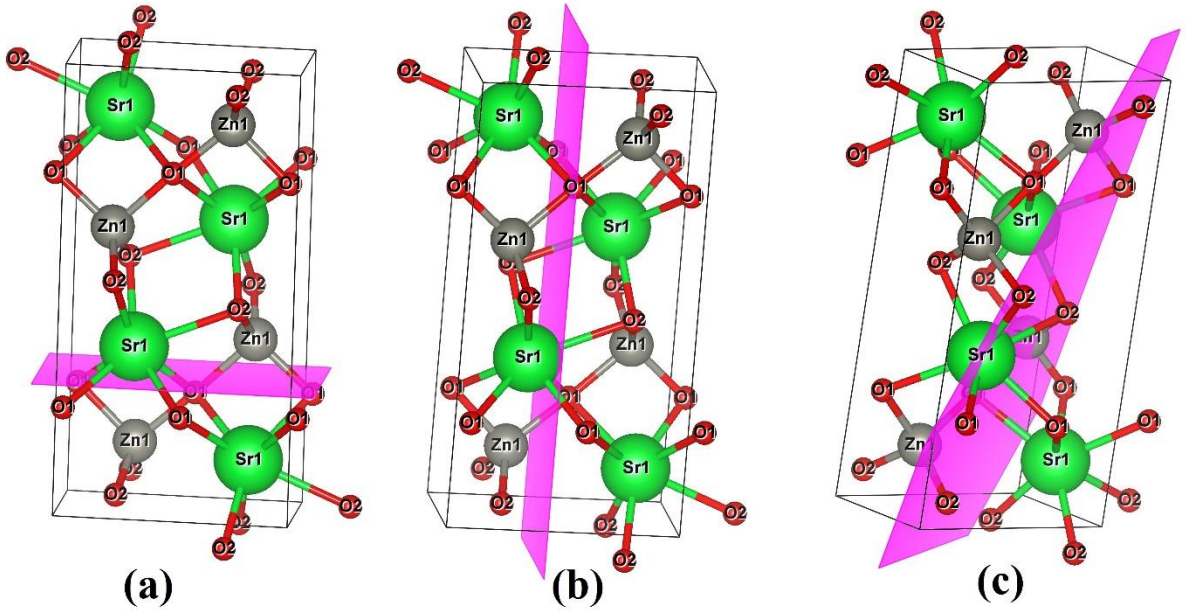

Figure S1: $SrZnO_2$ unit cell with (a) (004) plane; (b) (020) plane and (c) (111) plane.

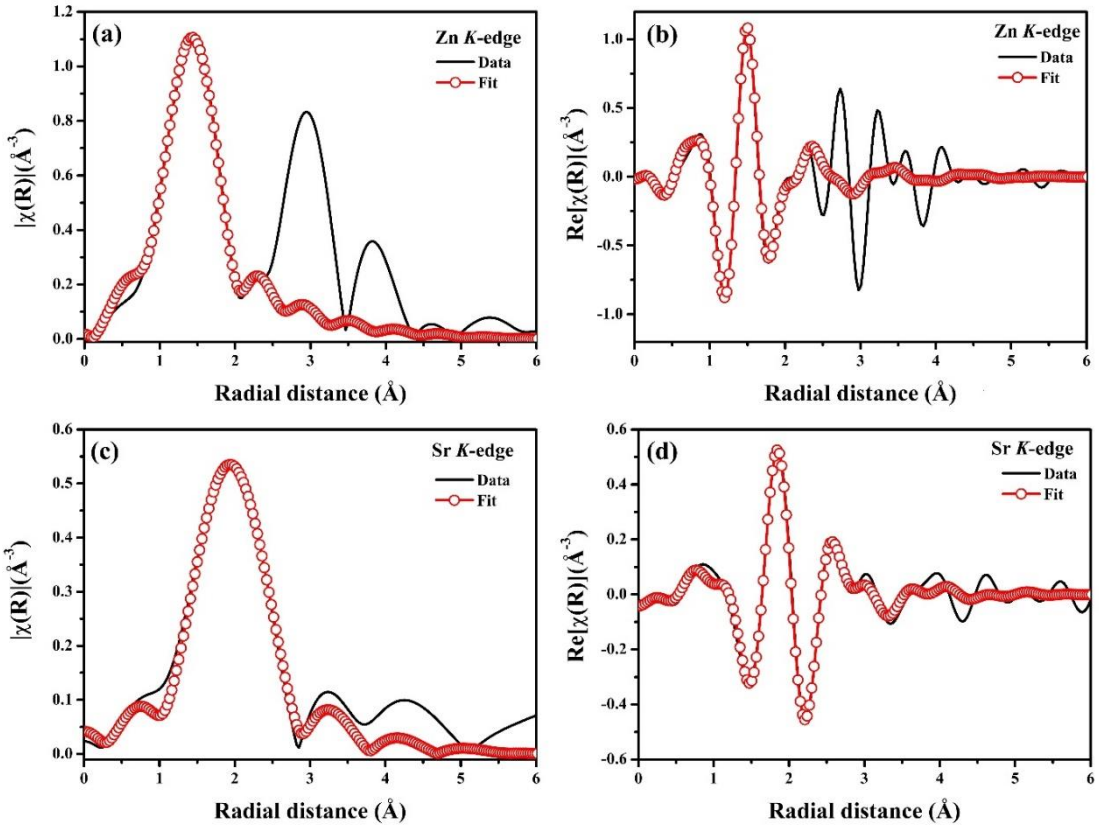

Figure S2: (a) and (c) represents magnitude of Fourier transformed EXAFS function for Zn *K*-edge and Sr *K*-edge, respectively. (b) and (d) represents real part of Fourier transformed EXAFS function for Zn *K*-edge and Sr *K*-edge, respectively. (The Fourier transformed curves shown here are phase uncorrected).

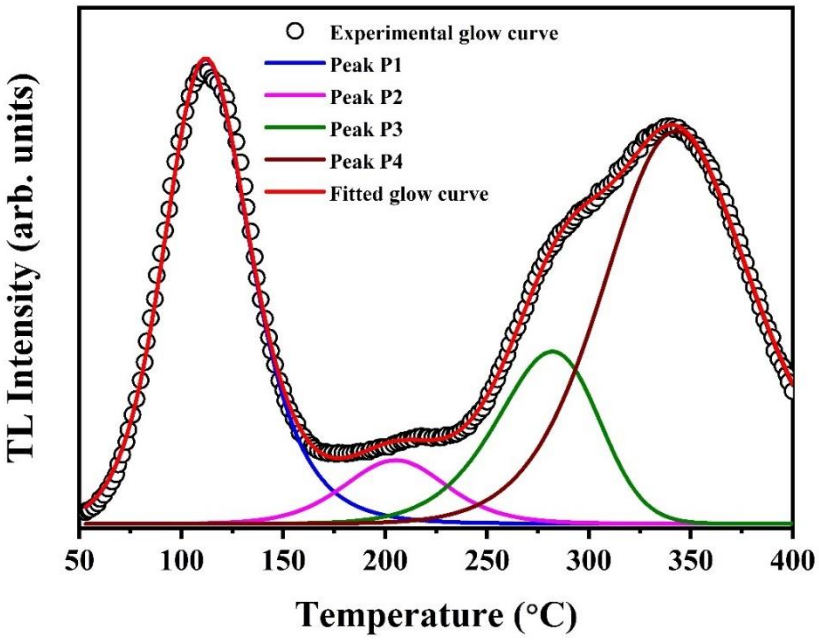

Figure S3: Computerized glow curve deconvolution of thermoluminescence glow curve obtained at 1 kGy gamma radiation dose.

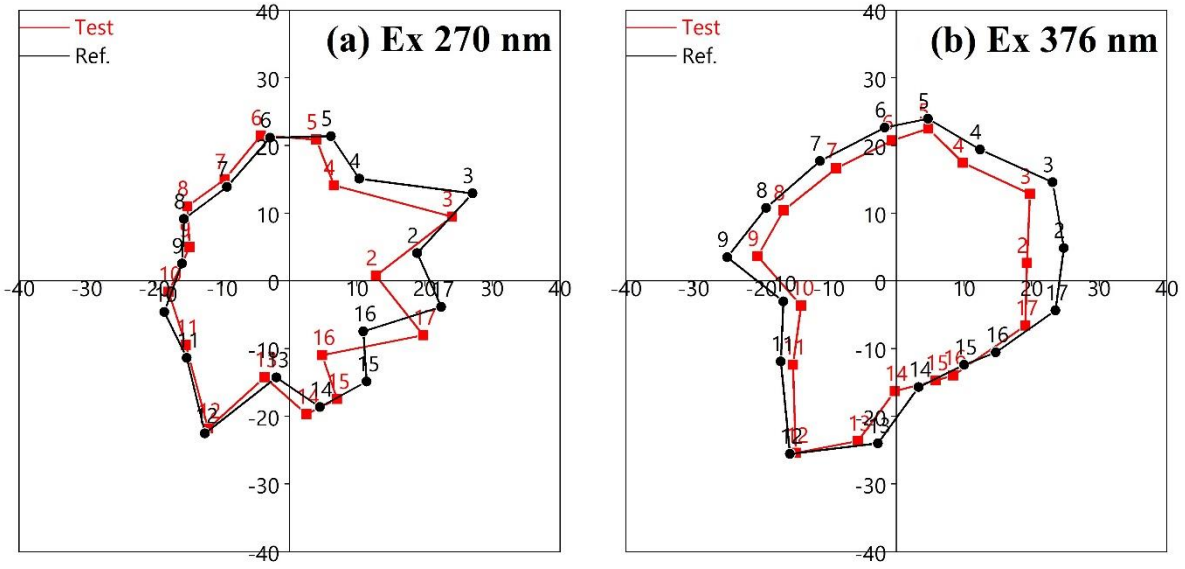

Figure S4: TM-30 distortion graphic for $SrZnO_2$ nanophosphors at (a) 270 nm excitation and (b) 376 nm excitation.