EUCALL workshop
On
“Theory and Simulation of Photon-Matter Interaction”
Szeged, Hungary

“Local structure analysis and luminescence study of $SrZnO_2$ nanoparticles”

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$SrZnO_2$

- Wide band gap semiconducting oxide.
- Band gap = 3.4 eV
- Space group *Pnma* of orthorhombic family.
- Widely explored for its luminescence properties.
- Pure phase luminescence have not been explored comprehensively.
- Found to give defect assisted white emission in pure state.

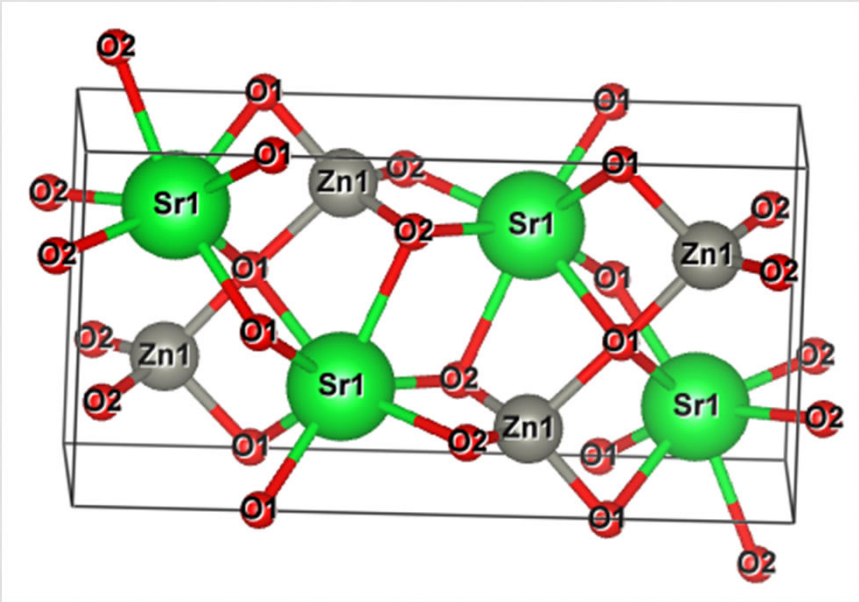


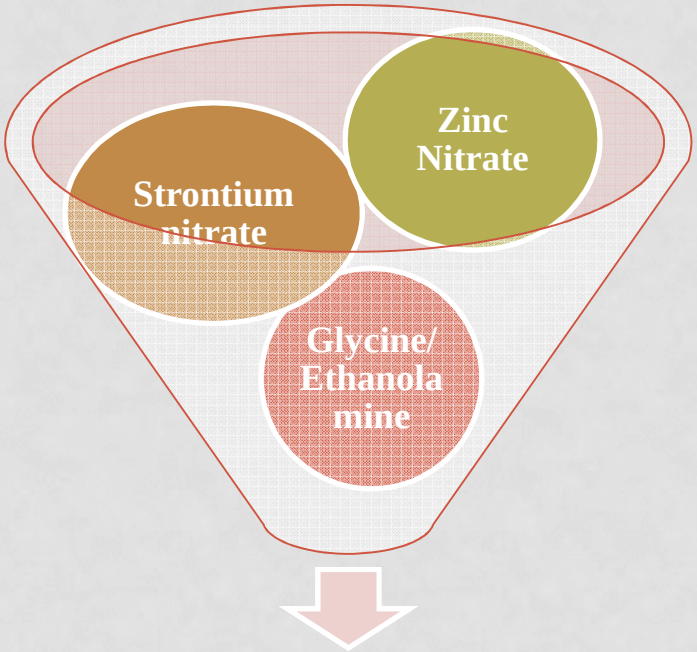
Figure 1: Unit cell of $SrZnO_2$

Synthesis

- Synthesized by combustion reaction.
- Nitrate precursors were used.
- Effect of two different fuel have been studied.
- Glycine ($C_2H_5NO_2$) and Ethanolamine (C_2H_7NO) are used separately:

a) $SrZnO_2$ prepared using glycine fuel: **SZO-G**

b) $SrZnO_2$ prepared using ethanolamine fuel: **SZO-M**



X-Ray Diffraction (XRD):

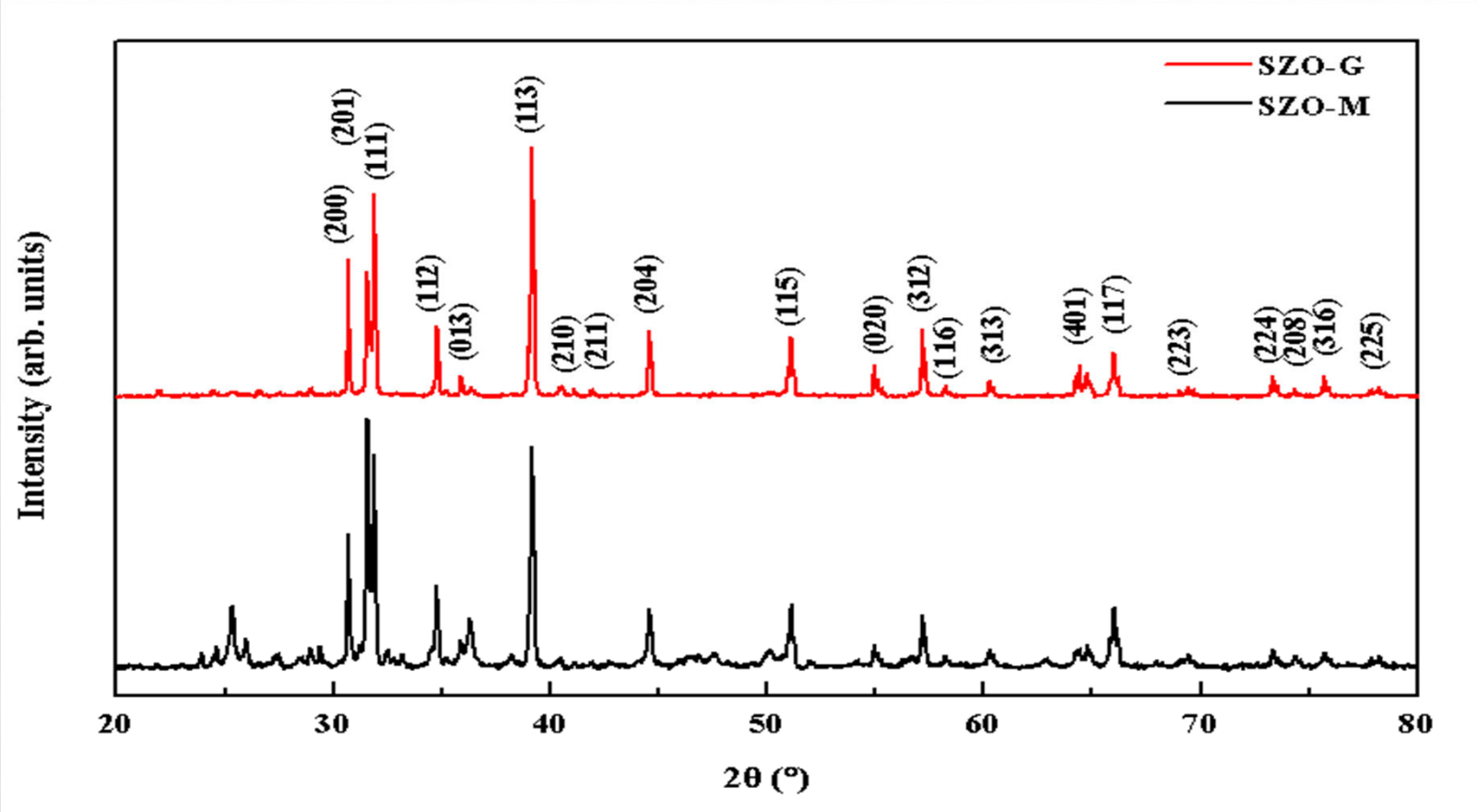


Figure 2: XRD pattern of SZO-G and SZO-M, representing extra phase in SZO-M.

Photoluminescence (PL):

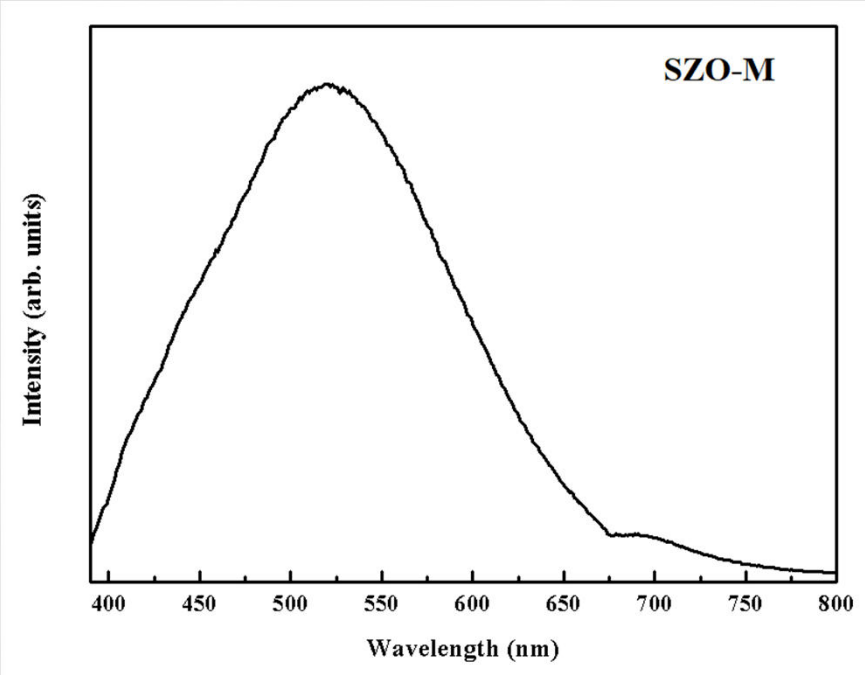


Figure 3: PL spectra of SZO-M at excitation of 375 nm.

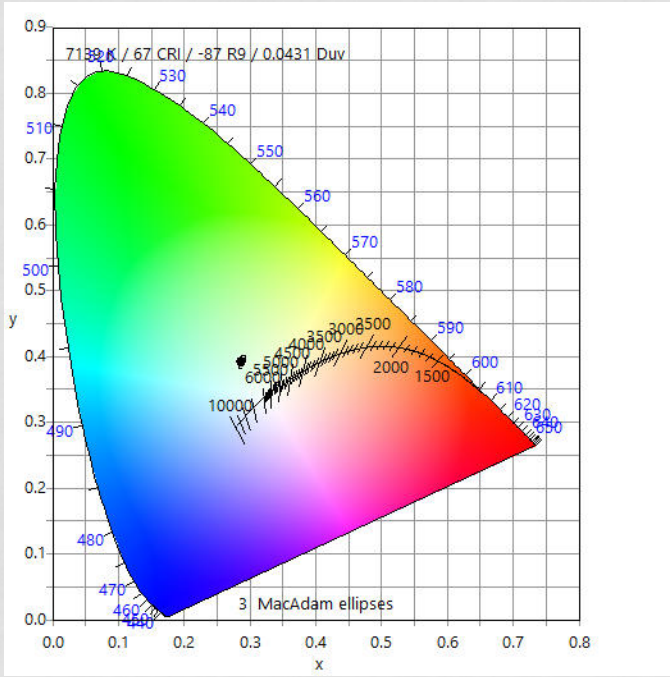


Figure 4: CIE co-ordinate diagram of SZO-M.

The corresponding absorption spectra of SZO-M showing two absorption peaks.

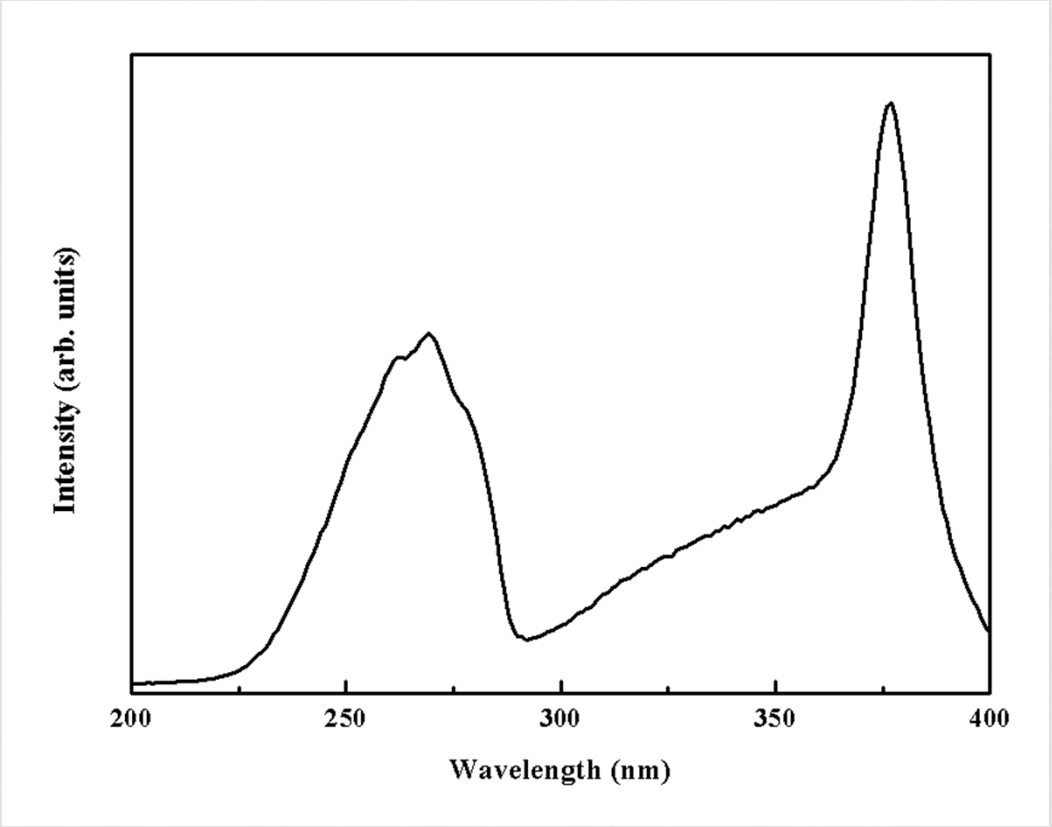


Figure 5: PL excitation spectra of SZO-M at 375 nm emission.

The emission spectra of SZO-M, at an excitation of 270 nm, showing **blue** emission.

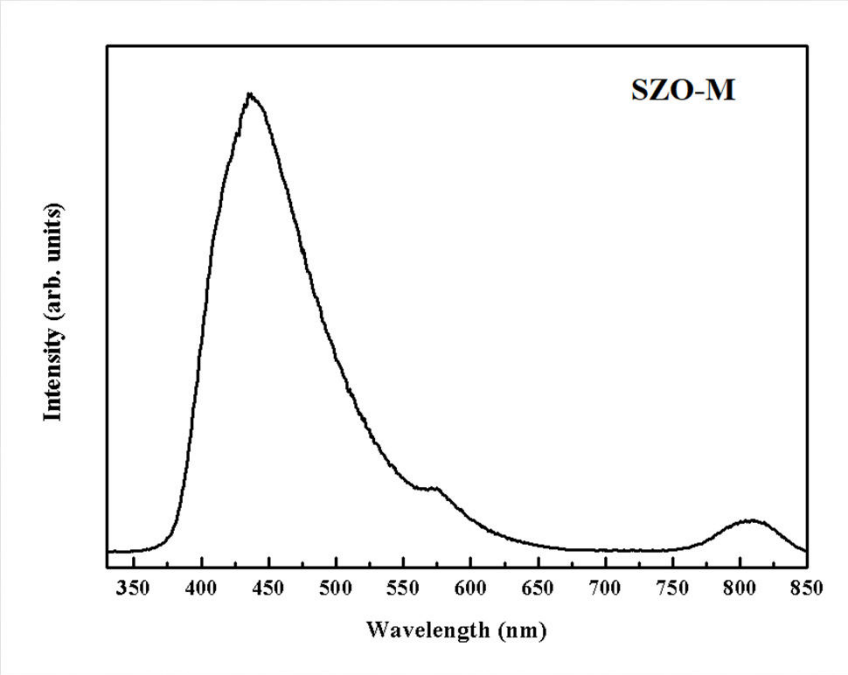


Figure 6: PL spectra of SZO-M at excitation of 270 nm.

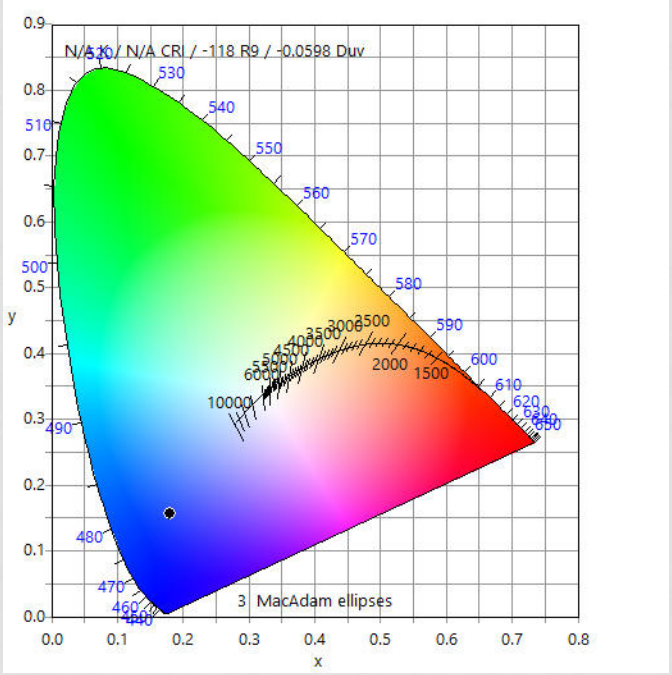


Figure 7: CIE co-ordinate diagram of SZO-M.

Similarly, the luminescence of SZO-G was also monitored at 270 nm and 375 nm as well, showing **white** emission in both cases.

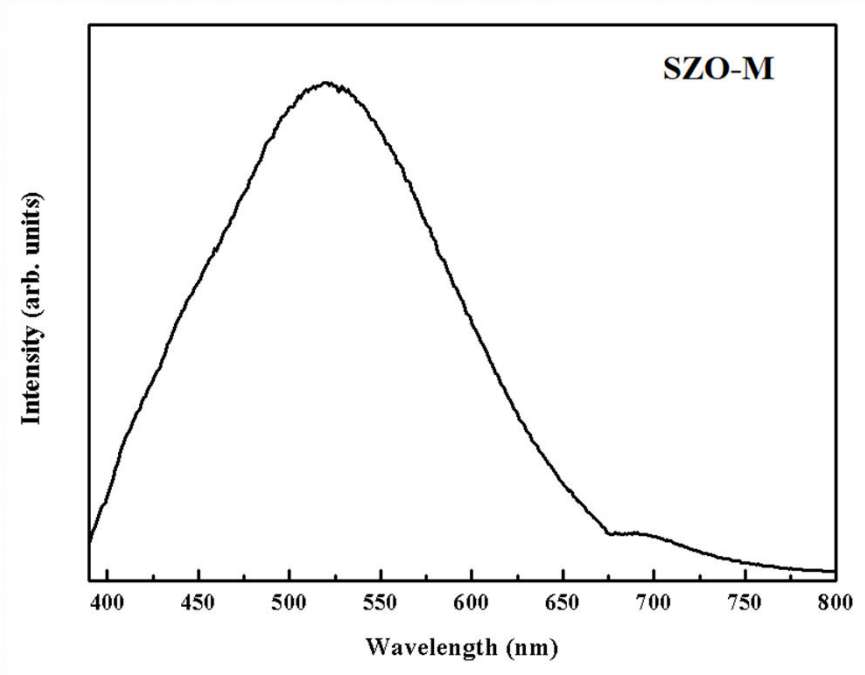


Figure 8: PL spectra of SZO-G at excitation of 375 nm.

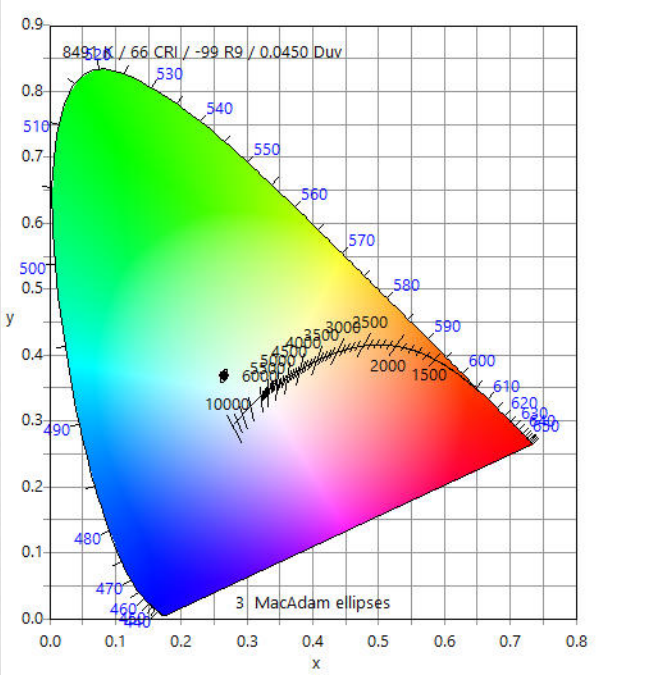


Figure 9: CIE co-ordinate diagram of SZO-G.

The emission profile at 270 nm excitation in SZO-G is slightly different than that in SZO-M.

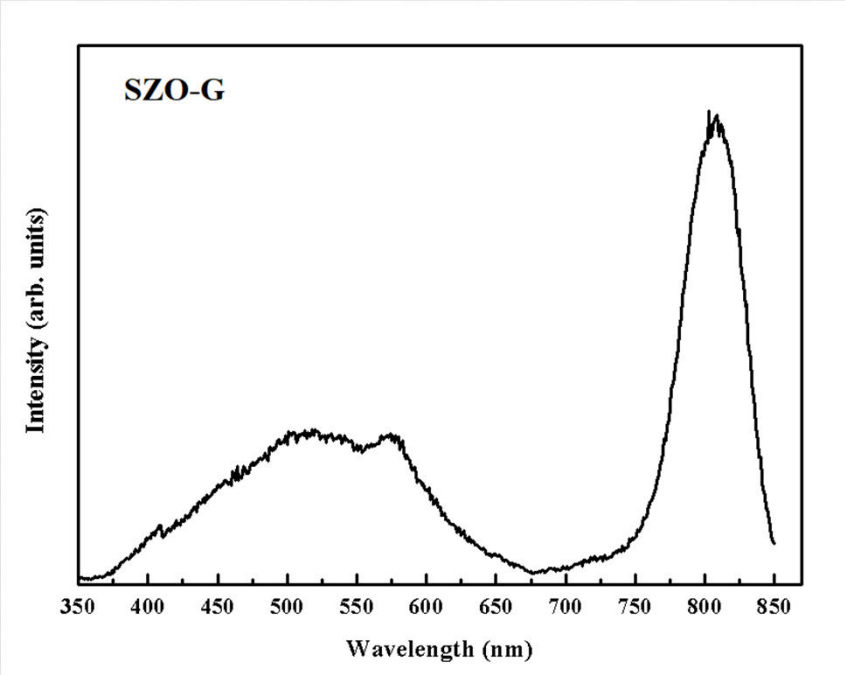


Figure 10: PL spectra of SZO-G at excitation of 270 nm.

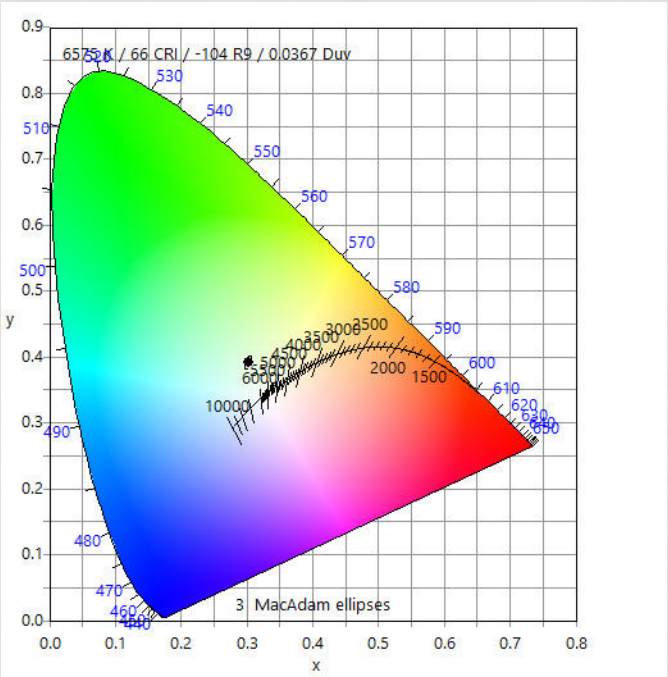


Figure 11: CIE co-ordinate diagram of SZO-G.

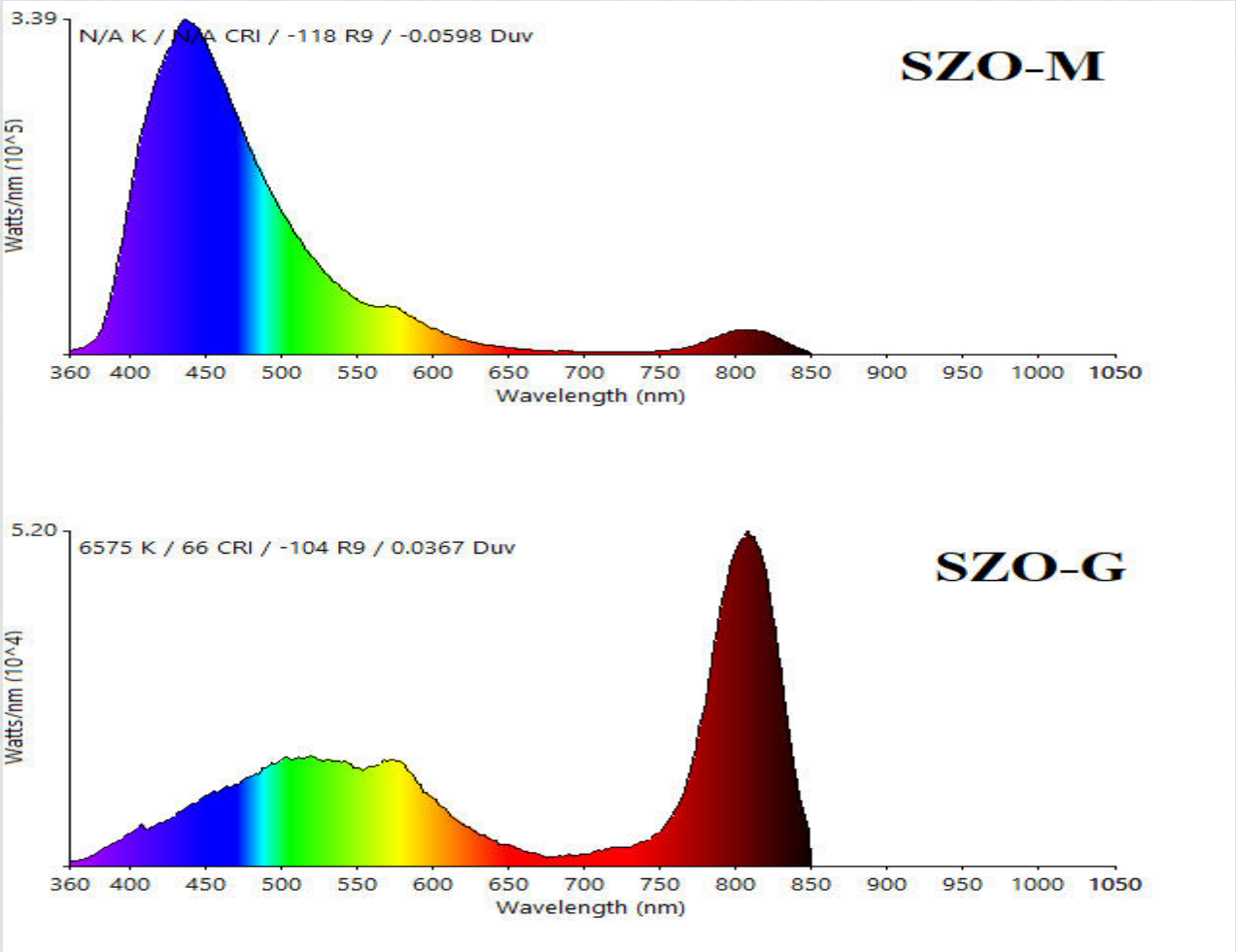


Figure 12: Comparison of PL emission spectra of SZO-M and SZO-G, at 270 nm excitation.

XANES:

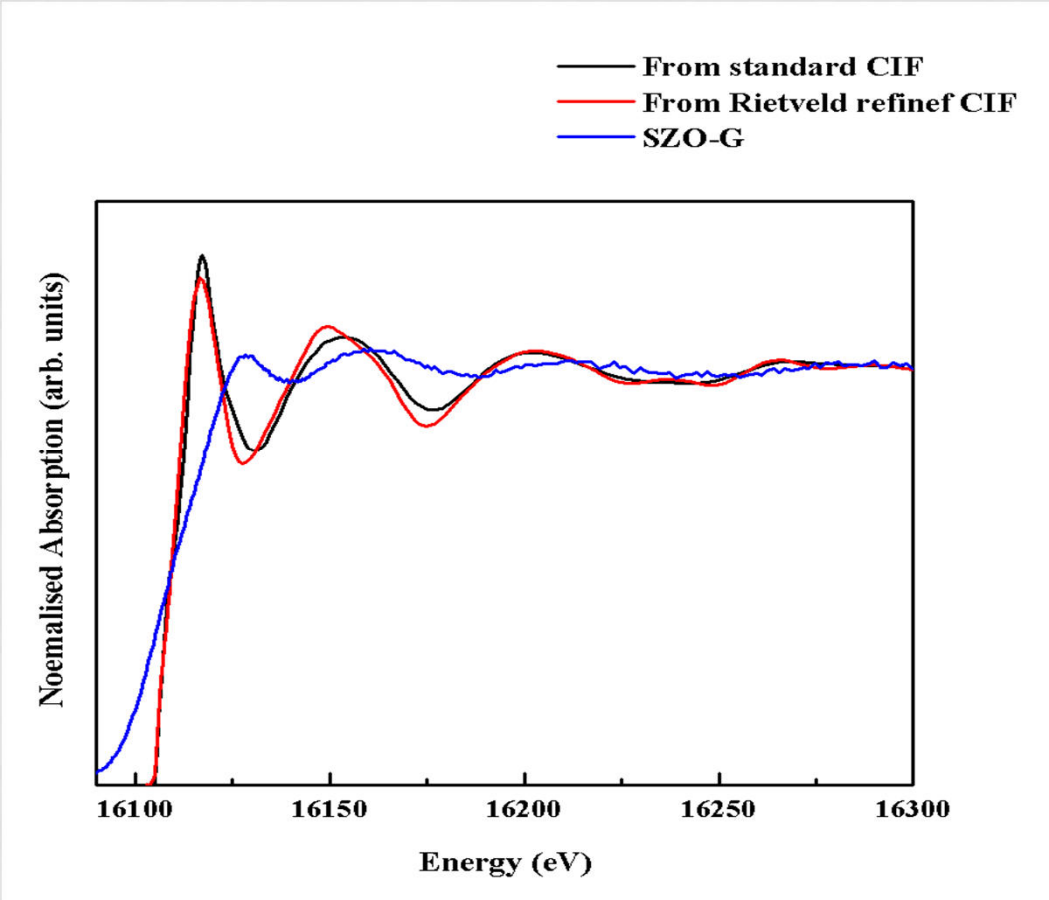


Figure 13: Normalised XANES spectra of SZO-G compared with FEFF simulated spectra, using standard and Rietveld generated crystallographic information.

Conclusion:

- $SrZnO_2$ is a potential candidate for luminescent material and is theoretically infant.
- It's defect structure can be engineered to get emission in visible as well as NIR region.
- The origin of visible and NIR emission is expected to be due to presence of oxygen vacancies or cation defects.
- The detailed theoretical study is needed to ascertain the defect structure of $SrZnO_2$.

References:

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Thank you !!