UNIVERSIDAD COMPLUTENSE MADRID

FACULTAD DE CIENCIAS FÍSICAS

Understanding the UV luminescence of Zn_2GeO_4: The role of native defects

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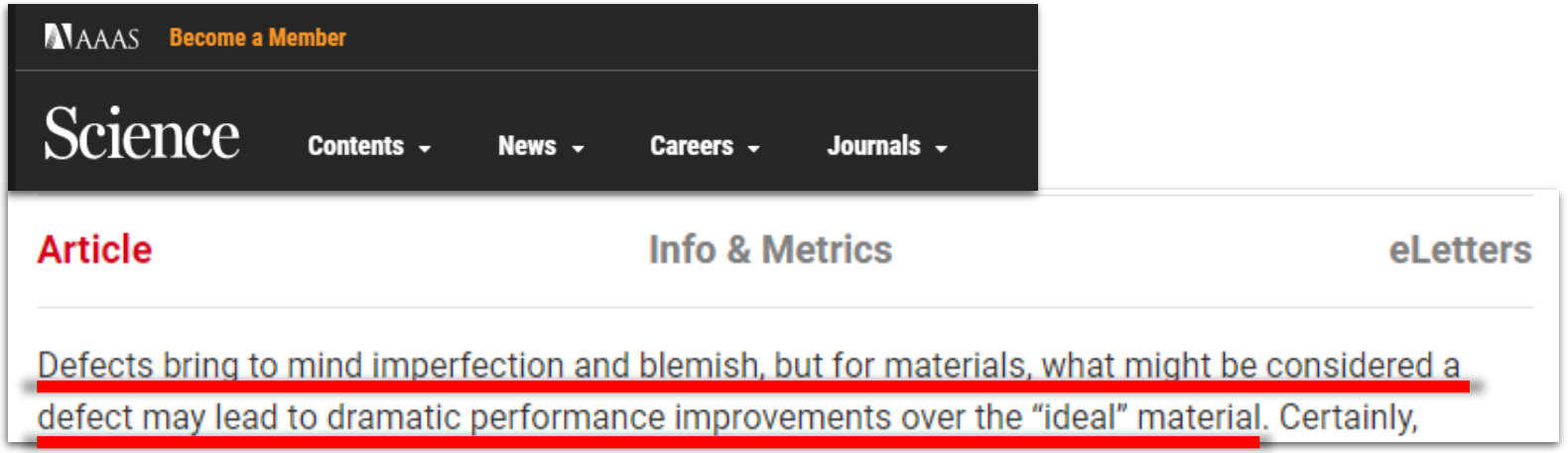
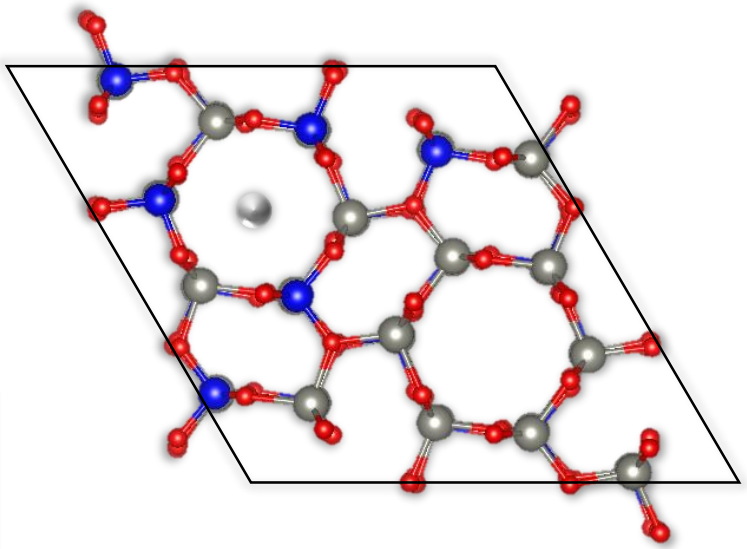
Introduction: Defects

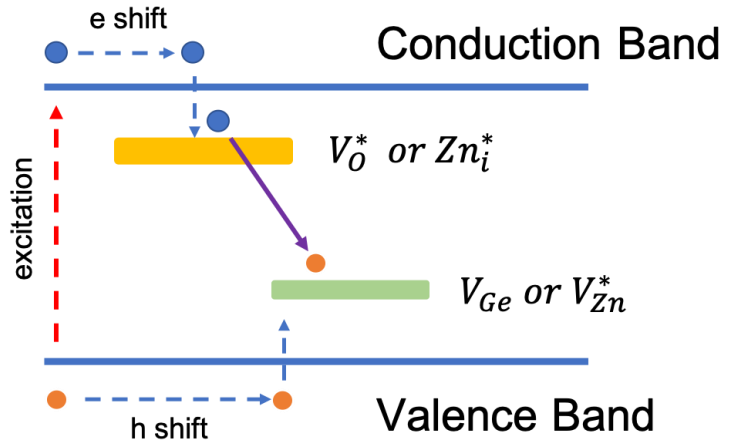


https://science.sciencemag.org/content/281/5379/939

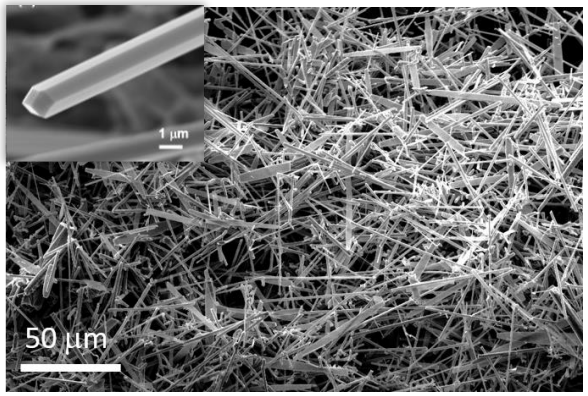


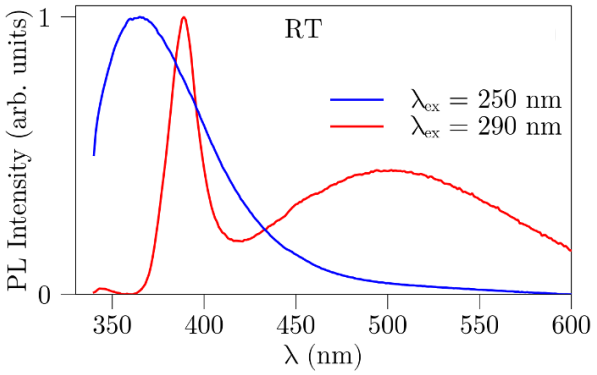
NATIVE DEFECTS

The proposed native defects responsible for the luminescence properties in undoped Zn_2GeO_4 are oxygen vacancies (V_O) and interstitial zinc (Zn_i), with a **donor character**, and zinc vacancies (V_{Zn}) and germanium vacancies (V_{Ge}) **as acceptors**.

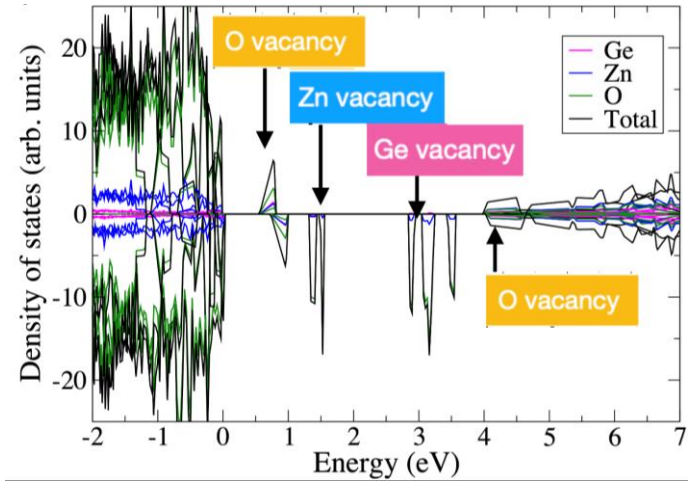


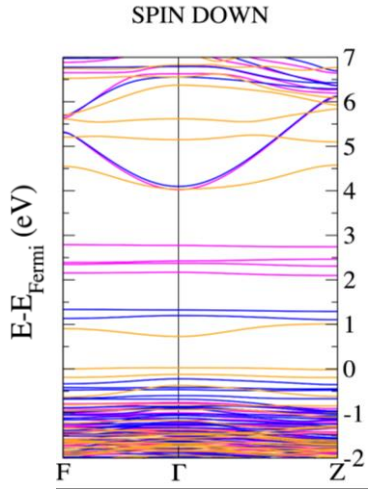
Defects & Luminescence



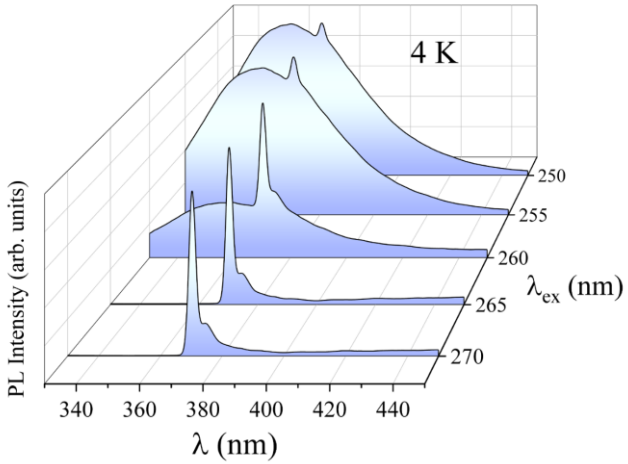


First-principles calculations

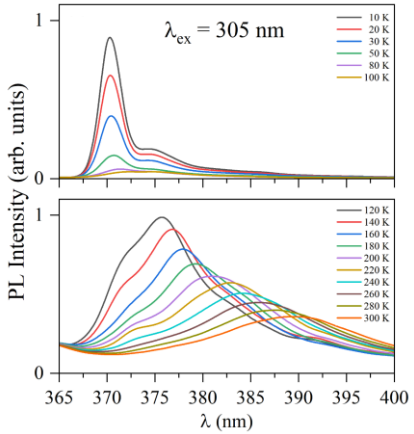




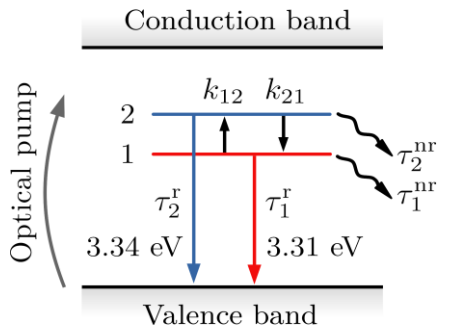
Excitation Energy



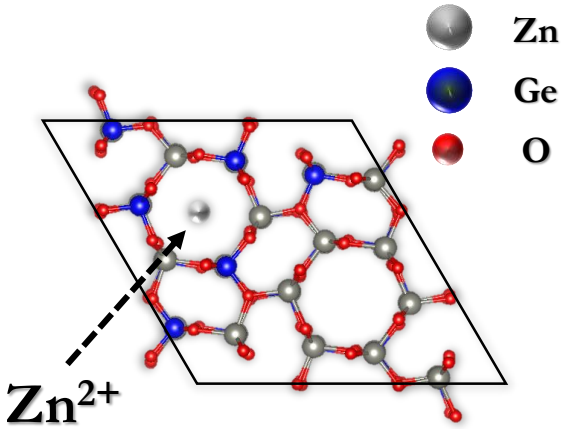
Temperature



Kinetics luminescent processes

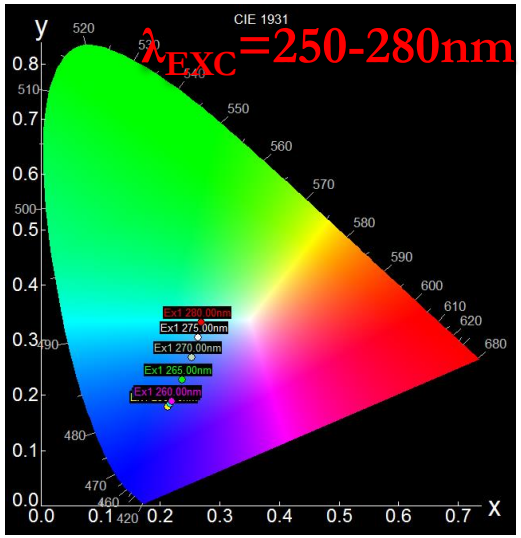


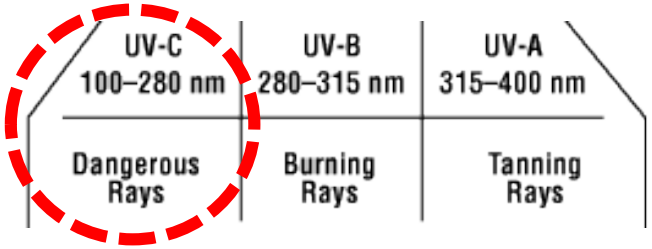
$$I_2(T) = \frac{I_2^0}{1 + A_2 + B_2 \exp(-E_{2a}/k_B T)},$$



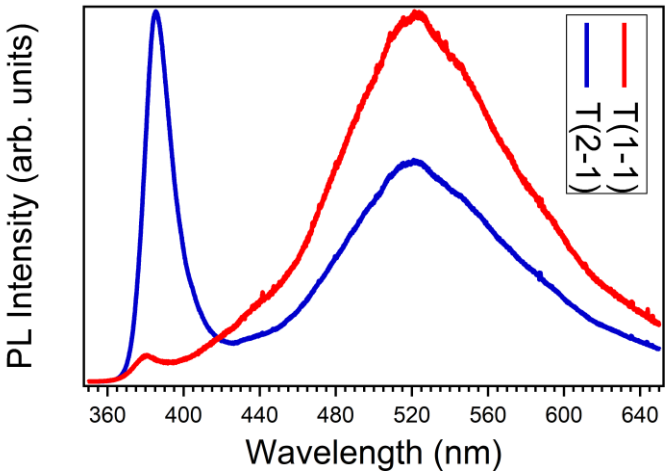
What for?

UV Detector

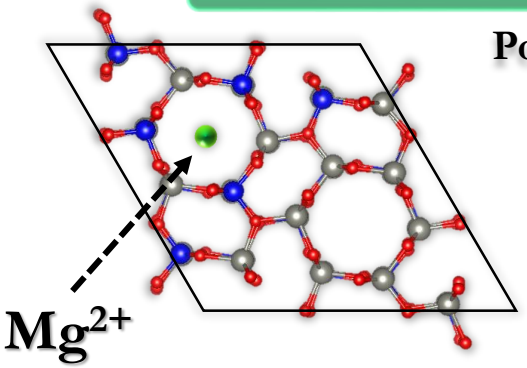




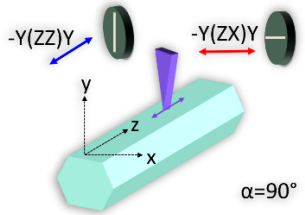
White-light emission



Energy storage



Polarized PL/Raman



Potential **solar cell candidate** because it is UV-blind.

Changes in temperature or surface cause changes in luminescence: **Sensing applications.**

Larger numbers of separated electrons and holes might lead to higher **photocatalytic** efficiency.