Nanostructure of luminescent Zn_kIn2O_{k+3} materials

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Several terms of the homologous series Zn_kIn2O_{k+3} ($3 \leq k \leq 13$) have been synthesized following solid-state reactions with an exhaustive control of the synthesis parameters. The structure consists of alternated layers of InO_2- octahedral and wurtzite-like $InZn_kO_{k+1}$+ blocks stacked perpendicular to the c-axis of the crystal, where zinc and indium occupy tetrahedral and trigonal bipyramid sites. Moreover, the zone axis show a gradual shift of the oxygen position in order to keep the polarization neutrality along c axis and allow the formation and stabilization of the structure, while no differences of the indium distribution inside the wurtzite blocks is visualized). On the other hand, images from zone axis show the characteristic nanostructured zig-zag modulation of this homologous series. Electron energy loss spectroscopy (EELS) confirms the preference site of In3+ along this zig zag pattern. Cathodoluminescence measurements reveal a main emission band centered at 1.75 eV, which shows an increasing of intensity with k, and has been attributed to the existence of zinc vacancies. For this reason, the combined study of structural aspects and physical properties of these oxides, as addressed in this work, is necessary for a proper discussion of the results.

Speaker Biography

Julio Ramirez-Castellanos works in the synthesis and structural/microstructural characterizations of new functional inorganic materials by high-resolution electron microscopy. Currently, he is professor at Complutense University, Madrid. He is co-author of more than 100 reviewed scientific publications, 4 invention patents, and more than 100 communications to international conferences.

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