NATIVE “IMPERFECTIONS” ENABLES ROOM-TEMPERATURE P-TYPE CONDUCTIVITY IN -GA2O3

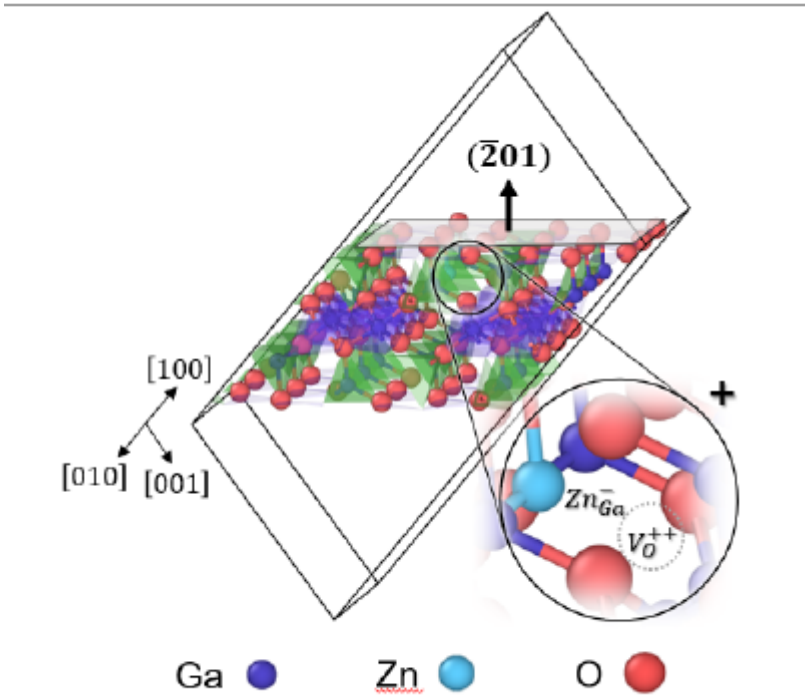
Researchers from GEMaC have demonstrated an important step for the realization of power electronics devices.

To realize the full functionality of any emerging electronic technology based on ultra wide bandgap semiconductors like -Ga2O3, both n- and p-type conductivity (i.e., bipolarity) should be attained. Therefore, it is critical to identify, experimentally investigate, and control the concentration of the native point defects in -Ga2O3 through growth parameters in order to determine the feasibility of achieving room temperature hole conductivity.

The motivation of the work featured in this highlight is to prove that native defects in -Ga2O3 can enable the realization of high hole conductivity thanks to shallow acceptor centres.

In this work, within the framework of National “GOPOWER” and International “GALLIA” collaborative projects, researchers from GEMaC have demonstrated for the first time that Zn doping of -Ga2O3/r-sapphire thin films grown by MOCVD technique can exhibit a long-time stable room-temperature hole conductivity with a conductivity activation energy of around 86 meV. The origin of this level might be attributed to a vacancy-zinc donor-acceptor complex (see figure). These results bring new evidence and help to break a “taboo” related to the feasibility of room temperature hole conductivity in Ga2O3 via traditional growth technique and doping. These results are likely to motivate further experimental research on the point defects in -Ga2O3. From the practical point of view, this investigation increases the portfolio of techniques to achieve the much wanted

homoepitaxial p-n junction for the emerging Ga2O3 ultra-wide semiconductor power electronics technology enabling, for example, proper ultra-high power PiN diodes.



Hypothetical crystal structure model of Zn-doped -Ga2O3 containing a V_O++-Zn_Ga– defect complex

Référence

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