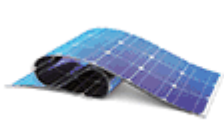



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Experimental determination of the (0/–) level for Mg acceptors in β -Ga₂O₃ crystals

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ABSTRACT

Electron paramagnetic resonance (EPR) is used to experimentally determine the (0/-) level of the Mg acceptor in an Mg-doped β -Ga₂O₃ crystal. Our results place this level 0.65 eV (± 0.05 eV) above the valence band, a position closer to the valence band than the predictions of several recent computational studies. The crystal used in this investigation was grown by the Czochralski method and contains large concentrations of Mg acceptors and Ir donors, as well as a small concentration of Fe ions and an even smaller concentration of Cr ions. Below room temperature, illumination with 325 nm laser light produces the characteristic EPR spectrum from neutral Mg acceptors (Mg_{Ga}^0). A portion of the singly ionized Ir⁴⁺ donors are converted to their neutral Ir³⁺ state at the same time. For temperatures near 250 K, the photoinduced EPR spectrum from the neutral Mg_{Ga}^0 acceptors begins to decay immediately after the laser



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to the Mg acceptor. Holes left in the valence band recombine with electrons at the deeper Ir³⁺ ions and restore the Ir⁴⁺ ions. An activation energy for the thermal decay of the Mg_{Ga}⁰ acceptors, and thus a value for the (0/-) level, is obtained by using a general-order kinetics model to analyze a set of five isothermal decay curves taken at temperatures between 240 and 260 K.

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