

## **Annealing and surface conduction on Hydrogen peroxide treated bulk melt-grown, single crystal ZnO**

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### **Abstract**

We report on the studies carried out on hydrogen peroxide treated melt-grown, bulk single crystal ZnO samples. Results show the existence of two shallow donors in the as-received ZnO samples with energy levels  $(37.8\pm 0.3)$  meV that has been suggested as  $Zn_i$  related and possibly H-complex related and  $(54.5\pm 0.9)$  meV, which has been assigned to an Al-related donor. Annealing studies performed on the hydrogen peroxide treated samples reveal the existence of a conductive channel in the samples in which new energy levels have been observed, Zn vacancies, related to the Group I elements,  $X_{Zn}$ . The surface donor volume concentration of the conductive channel was calculated from a theory developed by Look (2007) [\[1\]](#). Results indicate an increase in the surface volume concentration with increasing annealing temperature from  $60\times 10^{17}$  cm<sup>-3</sup> at 200 °C to  $4.37\times 10^{18}$  cm<sup>-3</sup> at 800 °C.