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Electronic Properties of ZnO: Reconciling Multiple Techniques[1]

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Significant progress has been made recently in our understanding of the electronic properties of ZnO and their physical origins, and yet we are far from being in possession of a complete picture despite decades of effort. Given the ultraviolet bandgap of this semiconductor (essentially the same as GaN), its easy synthesis using a wide variety of crystal growth techniques, the ready availability of high-quality single crystals, and intrinsic highly efficient luminescence, it is a material of great interest for a wide variety of device applications. Still, reliable p-type doping remains a considerable obstacle to realizing junction devices, and luminescence features often attributed to acceptor related transitions in fact have alternative physical origins. The role of impurities is reasonably well-understood, but a detailed understanding of dominant defects is somewhat elusive, although several techniques based directly and indirectly on Schottky contacts have provided some illumination on the topic. In this talk, I will summarize recent results in the field, and outline some of the key issues to which definitive answers are desirable if ZnO is going to be commercially competitive with GaN.

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