Visible-light nanoscale photoconductivity of grain boundaries in self-supported ZnO platelets

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Abstract

The response of individual grain boundaries in two dimensional polycrystalline ZnO platelets to visible light illumination is studied using scanning probe based techniques on the nanoscale. While many previous studies report and discuss the UV responses of ZnO, we find that even in the visible range of light below the band gap, grain boundaries are sensitive to light, this can be attributed to defect accumulation at the grain boundaries and associated photoexcitation of carriers. These findings suggest that engineered grain boundaries can be used for novel optoelectronic applications based on conductive channels in an otherwise wide-bandgap transparent material.