ZnO/ZnTe Heterojunction Diodes

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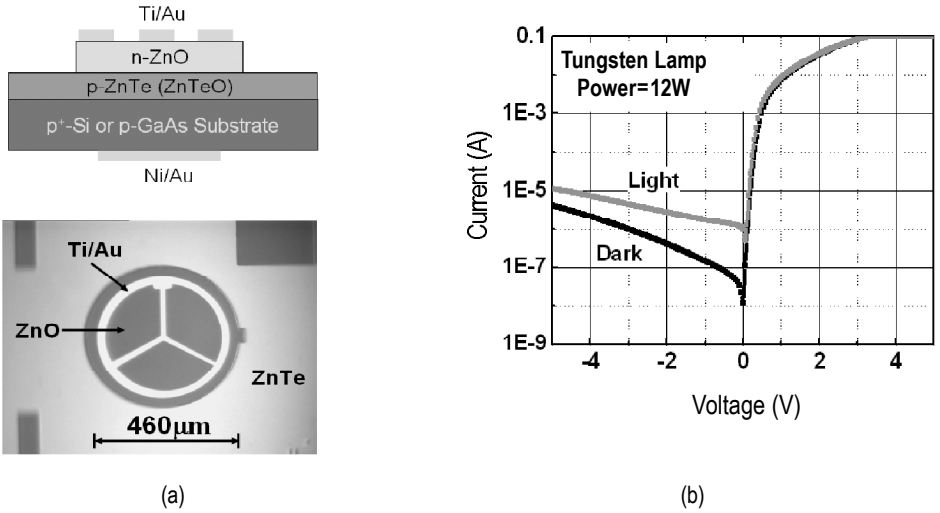

Schematic and photo of (a) ZnTe/ZnO heterojunction diode and (b) Current-Voltage characteristics in dark and under illumination from a tungsten lamp.

ZnO is a very attractive material for transparent electronics and optoelectronic device applications. However, the realization of many ZnO devices is limited by the absence of reliable p-type conductivity, a general problem for wide-bandgap semiconductors. On the other hand, ZnTe is a wide-bandgap semiconductor that has demonstrated highly conductive p-type material. In this work, ZnTe/ZnO heterojunction diodes were demonstrated. The devices demonstrate good rectifying characteristics with an on/off current ratio of approximately 10^5 and ideality factor of n~1.5. The diodes demonstrate a strong photoresponse in the UV/visible spectral region with a photovoltaic response, indicating potential use as a wide-bandgap junction in a multi-junction solar cell or for other general photodetector applications. The diodes do not currently show any significant light emission, but may show promise for future light-emitting devices upon reduction of defect density in the device structures. This project was supported by the Center for Optoelectronic Nanostructured Semiconductor Technologies, a Defense Advanced Research Projects Agency UPR award number HR0011-04-1-0040.