Studies of Surface Treatment Effects on the Metal-CdZnTe Interface

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The metal-CdZnTe interface is one of the dominant factors influencing detector performances. Electroless deposition usually produces good current voltage characteristics, but it is hardly compatible with photolithography. In this work it has been investigated the influence of different surface treatments on the electrical properties of the metal-CdZnTe interface. The study was performed on Cd0.9Zn0.1Te grown by Boron Oxide Encapsulated Vertical Bridgman technique. Samples of nearly 7mm x 7mm x 1.5mm were cut out of the grown ingots. Contacts were prepared using different procedures and current-voltage characteristics were recorded to monitor the effect of different surface treatments on the electrical characteristics of the device. The preparation procedures studied in this work concern: i) surface etching with Br-methanol ii) surface etching with a solution of bromine, lactic acid, and ethylene glycol iii) the growth an oxide layer for surface passivation by using a solution of 10% wt NH4F, 10% wt H2O2, and de-ionized water iv) gold thermal deposition v) thermal treatment of contacts. A proper choice of the process parameters permits to strongly limit the leakage current. After this study, it has been possible to fix an optimal configuration for CdZnTe based devices, which comprehends surface oxidation, the guard ring and the thermal treatment. The final current-voltage characteristics can be described by two diodes in configuration back to back.