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#### **ACCEPTED MANUSCRIPT**

## 1 Low leakage current Ni/CdZnTe/In diodes for X/γ-ray detectors

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#### 10 Abstract

- The electrical characteristics of the Ni/Cd<sub>1-x</sub>Zn<sub>x</sub>Te/In structures with a metal-semiconductor
- rectifying contact are investigated. The diodes, fabricated on the base of In-doped *n*-type Cd<sub>1</sub>.
- 13  ${}_{\rm r}{\rm Zn_r}{\rm Te}$  (CZT) crystals with resistivity of ~10<sup>10</sup>  $\Omega$ ·cm, have low leakage current and can be
- used as  $X/\gamma$ -ray detectors. The rectifying contact was obtained by vacuum deposition of Ni on
- the semiconductor surface pretreated with argon plasma. The high barrier rectifying contact
- allowed us to increase applied reverse bias voltage up to 2500 V at the CZT crystal thickness
- of 1 mm. Dark (leakage) currents of the diodes with the rectifying contact area of 4 mm<sup>2</sup> did
- not exceed 3-5 nA at bias voltage of 2000 V and room temperature. The charge transport
- mechanisms in the Ni/CZT/In structures have been interpreted as generation-recombination in
- 20 the space charge region within the range of reverse bias of 5-100 V and as currents limited by
- space charge at both forward and reverse bias at V > 100 V.
- 22 Keywords: semi-insulating CdZnTe, Ohmic contact, rectifying contact, Schottky diode, I-V
- 23 characteristic, space charge limited current

#### 1. Introduction

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- Cadmium telluride (CdTe) and its solid solution  $Cd_{1-x}Zn_xTe$  (CZT) are the most
- important semiconductor materials for fabrication of spectroscopic  $X/\gamma$ -ray detectors
- operating without cryogenic cooling particularly in a significant photon energy range higher
- than 30-50 keV [1-3]. The main disadvantage of such detectors is incomplete charge collection
- 29 hence, a decrease in energy resolution [4, 5]. An increase in bias voltage, applied to the detector,

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