ZnTe and (Cd,Mg)Te layers as a contact for the high-resistivity (Cd,Mn)Te

Dominika Kochanowska[1,2], Aneta Wardak[1,2], Andrzej Mycielski[1,2], Krzysztof Gościński[1,2],

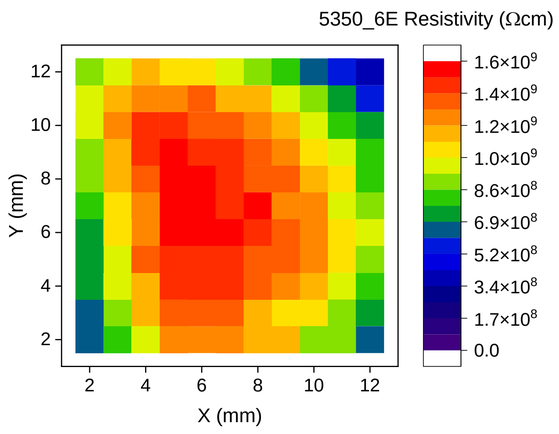
Anna Reszka[1], Adrian Sulich[1], Witold Chromiński[3], Piotr Bazarnik[3], Małgorzata Lewandowska[3]

[1] Institute of Physics, Polish Academy of Sciences, Aleja Lotników 32/46, PL-02668, Warsaw, Poland
[2]Puremat Technologies, Aleja Lotników 32/46, PL-02668, Warsaw, Poland
[3] Faculty of Materials Science and Engineering, Warsaw University of Technology, ul. Wołoska 141, PL-02507, Warsaw, Poland

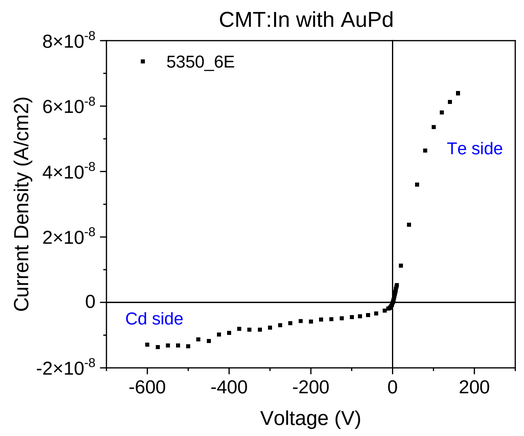
Introduction

The II-VI semiconductors with resistivity above 10^9 Ωcm suffer from the ohmic contacting problem due to their high electron affinity and relatively large work function compering to metals. To solve the problem of work function mismatch an amorphous layer between a semiconductor and metal junction was proposed by Sebestyen [1]. Such layers with a high density of defects provide better charge transport between metal and semiconductor material.

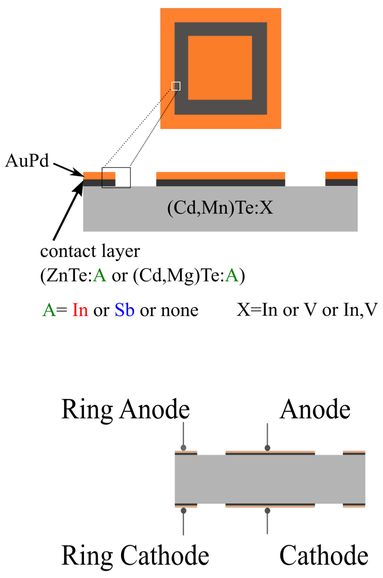
We will present our recent results obtained from **(Cd,Mn)Te samples with** resistivity in the range 10^9-10^{10} Ωcm. In this work, we want to focus on amorphous/polycrystalline layers. **ZnTe, ZnTe:Sb, ZnTe:In and (Cd,Mg)Te, (Cd,Mg)Te:Sb, (Cd,Mg)Te:In layers** were deposited in MBE chamber **and covered by AuPd layer**.



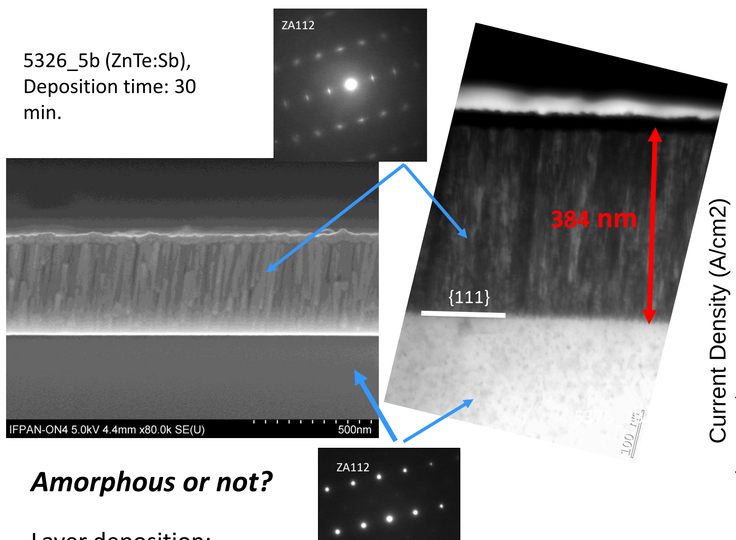
5350_6E AuPd contact directly on the (Cd,Mn)Te



We determine the polarity (Cd and Te side) of the CdMnTe sample surfaces [2]



ZnTe layer (SEM and TEM observations)



5326_5b (ZnTe:Sb), Deposition time: 30 min.

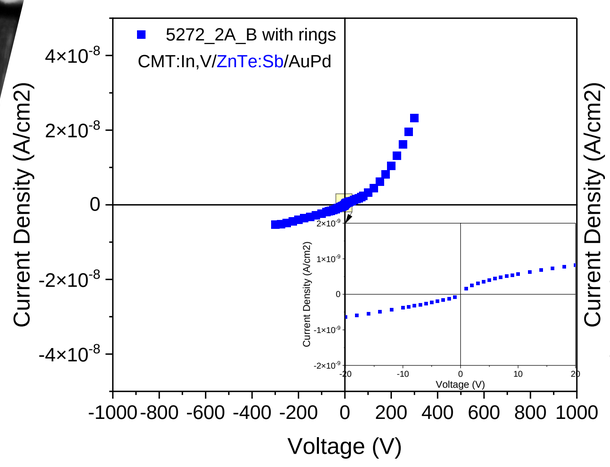
Amorphous or not?

Layer deposition:
ZnTe cell at T=660°C
Growth rate approx. 8.6 nm/min

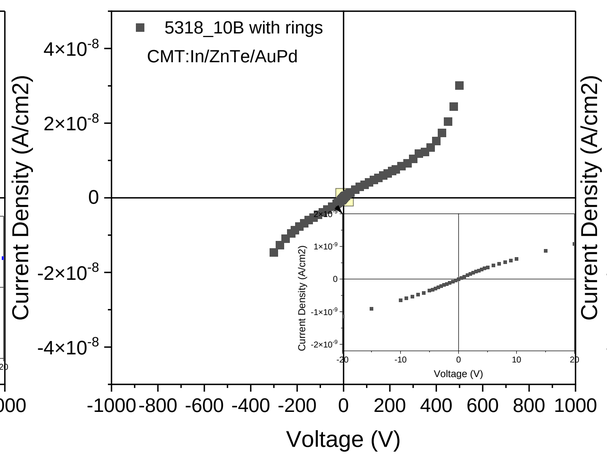
We observe columnar growth

ZnTe layers deposited on (Cd,Mn)Te

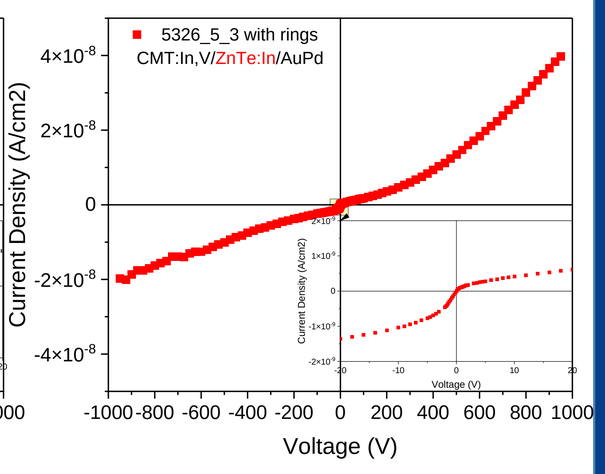
ZnTe:Sb layer



ZnTe layer

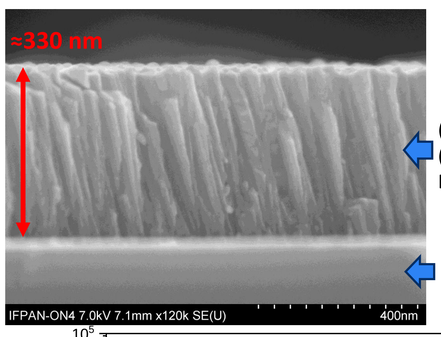


ZnTe:In layer



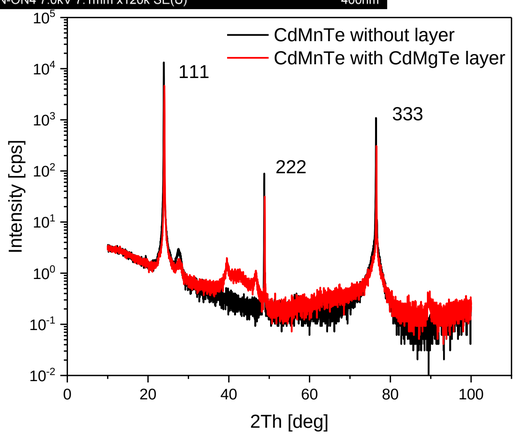
CMT:In = $Cd_{0,95}Mn_{0,05}Te$:In [In ~$10^{17}cm^{-3}$], CMT:In,V = $Cd_{0,95}Mn_{0,05}Te$:In,V [In ~$10^{17}cm^{-3}$, V ~$10^{12}cm^{-3}$]

(Cd,Mg)Te layer (SEM and XRD observations)



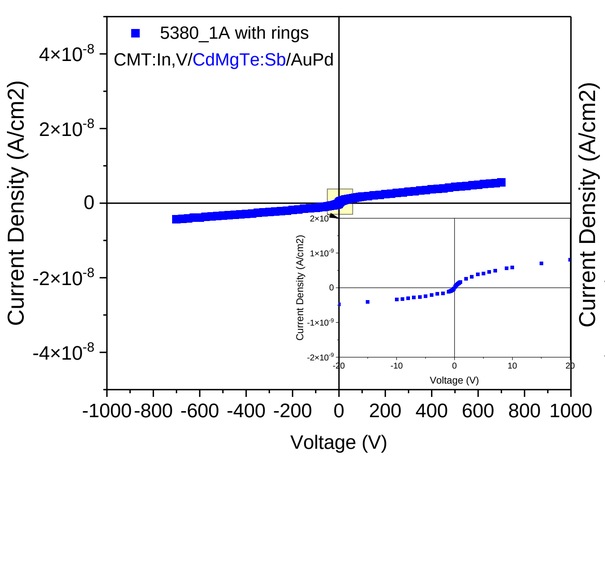
(Cd,Mg)Te layer
(Cd,Mg)Te cell at T=684 °C
Depotition time: 15 min.

5376_2B (Cd,Mn)Te with small grain in corner

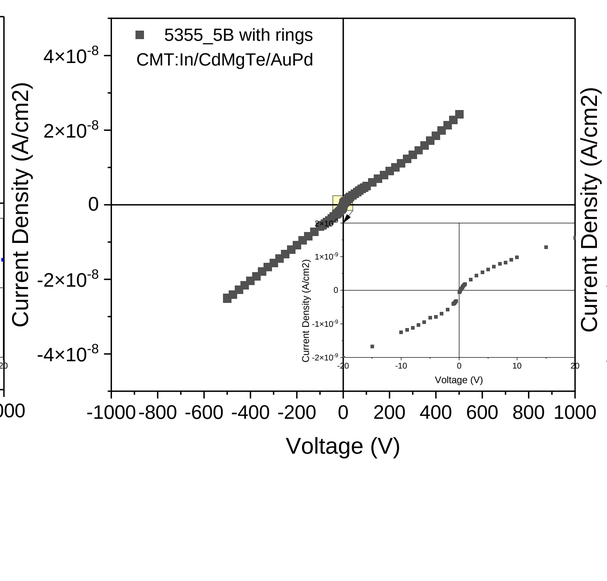


(Cd,Mg)Te layers deposited on (Cd,Mn)Te

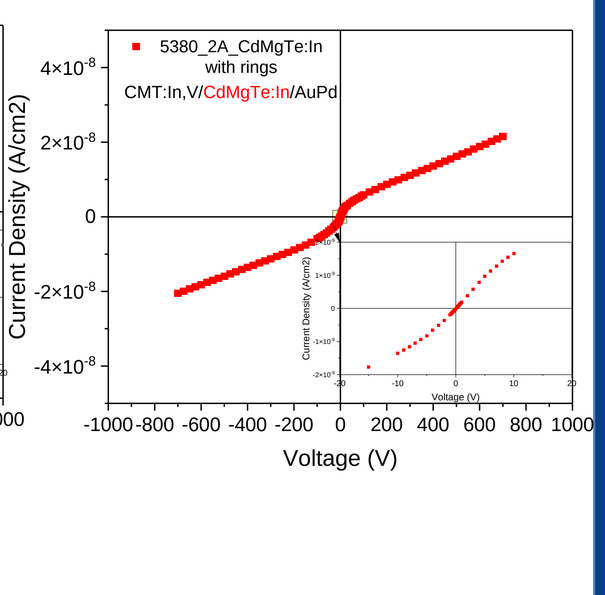
(Cd,Mg)Te:Sb layer



(Cd,Mg)Te layer



(Cd,Mg)Te:In layer



Summary:

- **Metal/(Cd,Mn)Te** contact shows Schottky I-V characteristic.
- Non-linear („Schottky") behavior of I-V characteristic on (Cd,Mn)Te with ZnTe:Sb/AuPd contact layer.
- The SEM and TEM measurements prove the "columnar" growth of ZnTe layers. We observe some degree of amorphization of ZnTe layers.
- **We obtained "columnar" (Cd,Mg)Te layers .**
- Quasi-linerar I-V characteristics for CdMgTe/AuPd layers were obtained

[1] T. Sebestyen, *Solid-State Electronic*, vol. 25, no. 7, pp. 543–550, 1982,
[2] J. W. P.D. Brown, K.Durose, G.J.Russel, *Journal of Crystal Growth*, vol. 101, pp. 211–215, 1990.
[3] M. Witkowska-Baran *et al.*, *IEEE Transactions on Nuclear Science*, vol. 58, no. 1, pp. 347–353, 2011.

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