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STUDY OF U-I AND U-C-2 CHARACTERISTICS OF A SCHOTTKY BARRIER DIODE BASED ON Zn x Cd 1-x S-Au

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Abstract
Two kind with temperature source and diaper under the circumstances semiconductor layers gas transportation in the way grower on the device $Zn_xCd_{1-x}S$ thin layers grown. Schottky diode harvest to do for taken Au metal for samples contact was given. Prepared U-I and U-C^{-2} of structures classifications research was done. From the analyses diode from structures passing photocurrent and depletion layer width films create during source and diaper to the temperature related that was revealed .

Keywords: Heterostructure, thin layer, Schottky diode, photodetector.

Introduction

$Zn_xCd_{1-x}S$ thin layers of the sun to the eye visible and ultraviolet to the field high sensitivity apparent does and this because of they based on different photovoltaic cells create successful results gives us It is known that **three component** semiconductor of materials morphology particles size and structural stoichiometry Depends on the components. ratio change through of the sample features management possible [1]. **$Zn_xCd_{1-x}S$** [2, 3] **II-VI** to the group belonging being a semiconductor material , **CdS** (cadmium sulfide) has a narrow band gap of 2.4 eV to the field has and **ZnS** (zinc sulfide) and relatively wider 3.7 eV bandgap to the field has was components is [4, 5]. Therefore, because, **$Zn_xCd_{1-x}S$** nanocrystals different semiconductor series harvest does, is prohibited field continuous to adjust opportunity gives and this material visible from the rays up to ultraviolet (U-V) was in the fields swallowing range cover [6,7]. This view from the point of view , $Zn_xCd_{1-x}S$ three component heterostructure researchers to interest reason is happening .
As is known , semiconductor and metal attached Schottky barrier diode structure to take possible , metal-semiconductor potential barrier structures high to efficiency has , easy and small dimensional They will be magnet to the fields sensitive not , glass vacuum to photocells than is more reliable [8]. Such features because of such

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structures many interest is waking up and they based on different kind research take is going .

From the above come out without our our research $Zn_x Cd_{1-x} S$ thin films create and Au metal to it contact to do through schottky diodes to take and their electrophysicist properties research from doing consists of .

Created structures VAX and Volt-Farad analysis through research will be done .

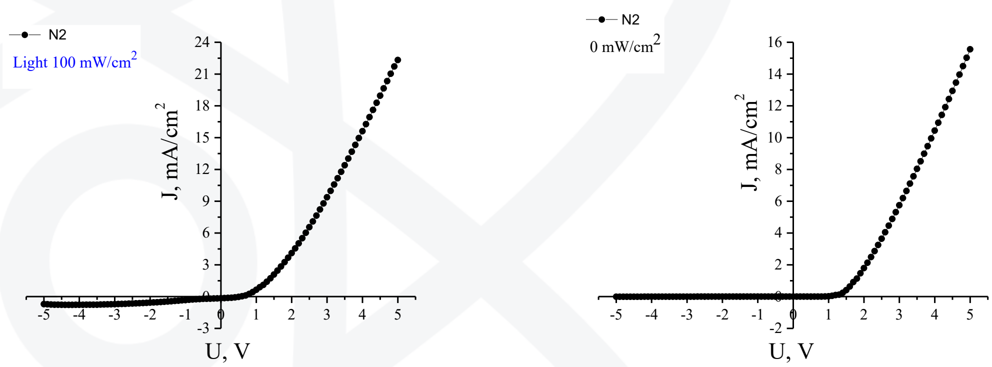
Experiment

Research semiconductor layers gas transportation in the way grower on the device was held , two kind tempered source and diapers under the circumstances $Zn_x Cd_{1-x} S$ thin films received . Carrier gas as hydrogen , base in quality and molybdenum from the substrate used . Preparation of sample 1 50 mg ZnS for and 600 mg of CdS powder taken , special to the bowl put research to the device placed . Examples inserted container considered as a source , 930 ^{o}C to temperature heated , then 30 min. time at a temperature of 760 C throughout molybdenum to the floor was laid down . Preparation of sample 2 for and 50 mg ZnS and 600 mg of CdS powders received , 30 min. time 950 C temperature in mobile phone from the source at a temperature of 800 C molybdenum to the floor was laid down .

Received to the examples upper to the part high vacuum Au layer under conditions (10^{-5} Pa) laid down and metal-semiconductor based on Schottky diode harvest Created. n a'munsing U-I and UC^{-2} features research was done .

Received results and his/her discussion

In Figures 1, 2 two kind temperature under the circumstances created $Zn_x Cd_{1-x} S$-Au Schottky diode structures voltage-current classifications cited .



a) b)

Figure 1. First of the sample bright and U-I graphic in the dark

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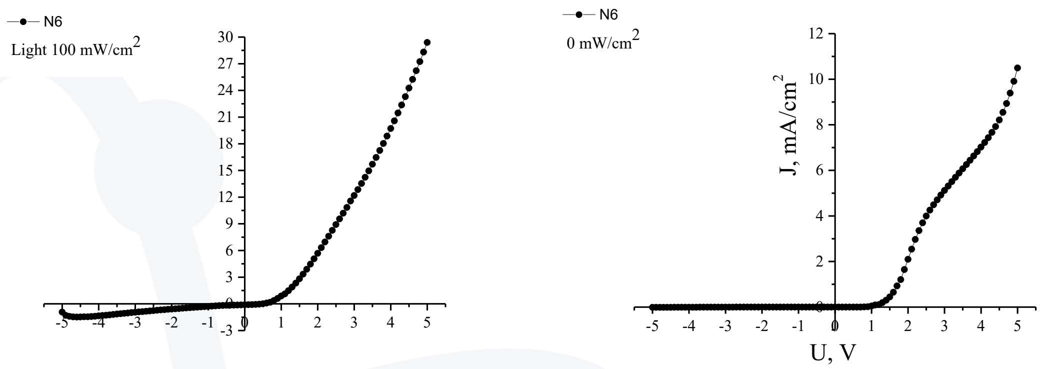
In picture 1 energy stream density 100 mW /cm² was light under the influence diode without structure passing of the vine source to the voltage dependency graph illustrated become, light when lowered flowing passing vine density big to values (up to 24 mA/cm²) . This photoemission process happened what is happening means: light energy as a result in semiconductor electron – hole couples harvest will be and they external electricity area under the influence to move comes. As a result vine increases and diode photoelectric property obvious manifestation will be . Also , in the graph right vine under the circumstances exponential growth , negative in tension and vine almost to zero equal what remains our vision possible . In Figure 1b graphic this diode structure unilluminated (0 mW /cm²) UI classification in the state is , this in case vine density much small is the maximum value approximately 15 mA/cm² . In this case only electricity field under the influence carriers (electrons) and (pits) move . Without light under the circumstances carrier concentration less happened for vine noticeable at the level less was.



a) b)

Figure 2. Second of the sample heart and U-I graphic in the dark

In picture 2 and second of the sample energy stream with a density of 100 mW /cm² light when lowered and 0 mW /cm² darkness in the conditions measured voltage-current classification Light in the case of vine density noticeable at the level high up to 27–28 mA/cm² This is enough . means light energy because of in semiconductor many electron – hole couples harvest It will be. That's right. in tension they speed with moves and as a result strong photocurrent harvest will be . Reverse in tension and stream almost zero to be remains , this is a p–n transition diode one one-sided conductivity shows . Light unless vine density is much lower , with a maximum of around 10–11 mA/cm² . Also , the graph shape without light diode in any case typical was exponential growth showing , but values from the light noticeable at the level small . This is just external voltage as a result harvest happening stream that it is indicates

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Volt-Farad characteristic of samples analysis and following conclusion gave . The first C^{-2} values for the sample (Figure 3) relatively big and C^{-2}–U lines slope higher that donors concentration lower that it is This situation shows internal electricity of the field relatively weaker to the formation take It also comes example metal – semiconductor on the border interface of quality better that it is and defects density less to be probability shows . Also , different capacitance at frequencies (10 kHz, 50 kHz, 100 kHz) values difference Does : Capacitance at low frequency (10 kHz) higher , higher at a frequency (100 kHz) capacity smaller to value achieved .

Second for example (Figure 4) and the C^{-2} values smallness donors concentration higher since evidence gives . In this relaxation layer thickness decreases and internal electricity field increases. The C^{-2}–U characteristic less to the slope has to be structure more alloyed or semiconductor layer structural denser that it is means. With this together, at low frequencies observable hard work interface and volumetric trap of the circumstances the existence confirms.

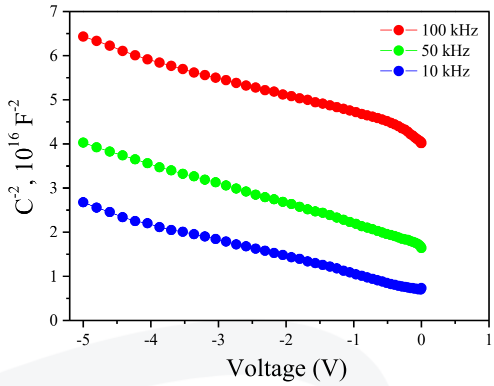

Figure 3. First of the sample different kind U-C $^{-2}$ at frequency classification

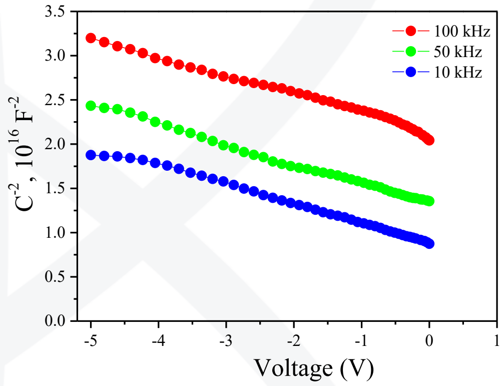

Figure 4. Second of the sample different kind U-C^{-2} at frequency classification

Conclusion

$Zn_xCd_{1-x}S$ thin layers created, taken Volt- Ampere of the samples and Volt-Farad analysis good diode structure that it was created showed. . High at temperature taken example with made diode in the structure strong photocurrent harvest was , depletion layer width higher that known This is the $Zn_xCd_{1-x}S$ material . optoelectronics and sun in the elements application for promising does.

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