ISSN: 2350-0328
International Journal of AdvancedResearch in Science, Engineering and Technology
Vol. 6, Issue 4, April 2019

IR Spectroscopy the Research and Structural and Chemical Properties of Own Oxides of Structures Metal-Semiconductor on the Basis of Indium Phosphide

I.R.Kamolov, D.I.Kamalova, G.I.Sayfullayeva

Associate professor, State unitary enterprise "Fan vataraqqiyot", Tashkent state technical university, Tashkent, Uzbekistan

P.G. student, State unitary enterprise "Fan vataraqqiyot", Tashkent state technical university, Tashkent, Uzbekistan

P.G. student, State unitary enterprise "Fan vataraqqiyot", Tashkent state technical university, Tashkent, Uzbekistan

ABSTRACT: In article a spectroscopic research and structural and chemical properties of own oxides of structures metal semiconductor on the basis of phosphide India is considered IR. The carried-out analysis of own anode, chemical and thermal InP oxides on the chemical structure aren't single-phase and stoichiometric and their chemical composition depends as on receiving conditions, and the modes of the subsequent heat treatment. IR – spectroscopic a research have shown that CO structures on the basis of phosphide India are not one, and multiphase educations containing mix of oxides and In and P oxides (In_2O_3+P_2O_5+$InPO_4$), and in TO phosphide india presence at quality of additive to $InPO_4$ and P_2O_5 is possible.

KEYWORDS: IR spectroscopy, oxides, chemical characteristic, thermal characteristic, structure, multiphase, india, phosphide, oxide, semiconductor.

I. INTRODUCTION

Recently the effort of scientists is directed to enhancement of materials with great potential opportunities as reduction of the sizes of elements, simplification of their construction, etc.

Structures metal - thin oxide - the semiconductor find broad application in the modern micro and optoelectronics. Properties of boundary of the section and an interphase layer considerably determine parameters based on these structures. Therefore, introduction of an interphase oxide layer with certain properties between metal and the semiconductor increases tension of idling and efficiency of photo transformers of solar energy. Researches of electro physical and photo-electric properties of structures metal - indium phosphide oxide - phosphide indium, carried out earlier [1, 2], set the optimum thickness of an oxide layer from the point of view of receiving the greatest efficiency of photo transformers. Composition of oxide layers it was not studied completely.

Having spent Auger the analysis of own anode, chemical and thermal InP oxides and based on results of other authors we came to a conclusion that they on the chemical structure are not single-phase and stoichiometric and their chemical composition depends as on receiving conditions, and the modes of the subsequent heat treatment. Already the analysis of difficult multicomponent objects does not give information necessary for authentic identification of their chemical composition, required for carrying out the comparative analysis of characteristics of own oxides created by different methods. Therefore, for the decision of this task, we addressed an IR spectroscopy technique.

II. SIGNIFICANCE OF THE SYSTEM

In article a spectroscopic research and structural and chemical properties of own oxides of structures metal semiconductor on the basis of phosphide India is considered IR. The study of literature survey is presented in section III, methodology is explained in section IV, section V covers the experimental results of the study, and section VI discusses the future study and conclusion.

III. LITERATURE SURVEY

Metal semiconductor on the basis of InP operations [1, 2] which on the example of thermal oxides showed prospects and effectiveness of use of this technique in case of a study of such objects are devoted to a research of ranges of IR absorption of own oxides of structures. As a research the own oxides (OO) of structures metal semiconductor based on InP created by anode, chemical and thermal oxidation were used.

IV. METHODOLOGY

Anodizing was carried out in water solution of citrate of ammonium in the potentiostaticmode (U=100 V), for chemical oxidation of structures metal - the semiconductor on the basis of InP were used the concentrated nitric acid (T=80 K, t=15 min) and thermal oxidation was carried out in a flow of the wet oxygen (T=723 K, t=30 min). The role of a metal covering was defined from comparing IR – ranges of the structures, which are not containing on the surface of oxide of a film of Au or Al. Metals were applied with method of thermal pulverization.

Ranges registered on two-ray IR a spectrometer (IRS-29) by the method described in [3] and to the main on measurement of intensity of the IR reflection absorption, which repeatedly passed through structure of R, polarized radiation in case of oblique angles of appropriateInP. The choice of this method is based that it allows in the same conditions to take measurements of structures with a metal covering and without it and increases contrast range of the measured ranges. It is reached due to reduction of losses in case of reflection on section boundary air – metal semiconductor and increases in an effective thickness of the measured oxide layers. In case of the specified mode of measurement it is possible to register also absorption bands on surface statuses of a film which frequencies are close to frequencies of longitudinal optical modes which intensity can be higher than at cross modes of $I \approx Sin/(Kd)^2$ where film d thickness, K wave vector.

V. EXPERIMENTAL RESULTS

For separation in absorption of a contribution only from controlled layers of own oxides the reversal spectrum of a substrate of compositions based on InP written in the same conditions was subtracted from the measured absorption spectra. The carried-out comparing of the modes of one-fold and repeated reflection absorption showed that in the latter case the intensity of all bands increases linearly. Such situation confirms legitimacy of use for increase in contrast range of ranges of a technique of repeated passage, allowing to increase thereby the accuracy of identification of absorption bands of oxides of compositions on the basis of InP which are shown on ranges in the form of steps and to facilitate expansion of difficult ranges on Gaussian components.

In a figure 1 are provided IR absorption spectra of structures of the own oxide (OO) of structures metal semiconductor based on InP created in different conditions. It is visible that in the spectral range of 1400-800 sm^{-1} the given ranges represent broadband with structure in which it is possible to select characteristic absorption bands in case of 940, 1010, 1090, 1190, 1150 and 1220 sm^{-1}. If to consider that for this connections characteristic absorption bands in case of 940 sm^{-1}, 1090 sm^{-1}, 1140 sm^{-1} ($InPO_4$), 1220, 1150, 1015 sm^{-1} (P_2O_5) and 1090 sm^{-1}, 1050 sm^{-1} (In_2O_3), then we will set that all absorption bands stated above selected on the experimental IR spectrums - absorption (CO) structures metal semiconductor on the basis of InP though is watched in reference ranges, but there is no complete compliance of the experimental IR spectrums with one of reference ranges separately. Based on it we will conclude that OO of structures metal semiconductor based on InP are not one, and multiphase educations comprising a compound of oxides and In and oxides P(In_2O_3+P_2O_5+$InPO_4$). And the percentage of separate components in CO of structures metal semiconductor on the basis of InP, apparently on difference in intensity of separate bands, is not constant and depends on many factors including from a method of formation of own oxides. For the thermal oxide (TO) of structures metal semiconductor on the basis of InP which are grown up in an oxygen flow comparison of the experimental and reference IR ranges convincingly demonstrates that the dominating phase in such CO are structures InPO metal semiconductor two well separated series of bands, approximately equal on intensity, in case of 940 and 1085 sm^{-1} are characteristic. Thermal oxides of structures metal semiconductor based on InP in case of $T>400^oC$ represent structures $InPO_4$ metal semiconductor with the component.

ISSN: 2350-0328

International Journal of AdvancedResearch in Science, Engineering and Technology

Vol. 6, Issue 4, April 2019

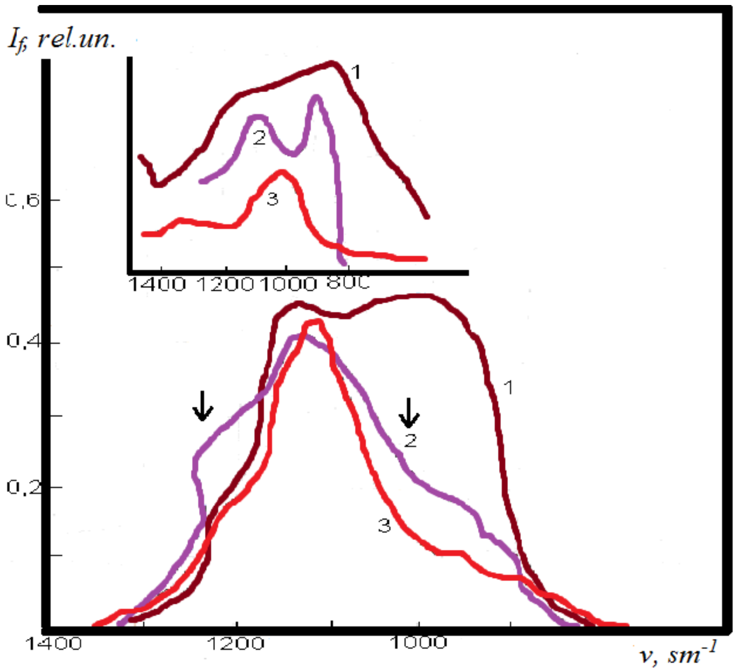

Fig. 1. Reflection IR spectrums absorption of TO (1), XO (2), AO InP (3) (a) and reference IR spectrums absorption of P_2O_5 (I), $InPO_4$ (2), In_2O_3 (b)

According to IR spectroscopy we can also state presence along with structures $InPO_4$ metal semiconductor in TO In_2O_3 indium phosphide as $InPO_4$ absorption band. Along with In_2O_3 presence at quality of the component to $InPO_4$ and P_2O_5 is possible. In particular specifies appearance it on IR ranges of a feeble band in case of 1220 sm^{-1}, which it is watched only in IR spectrum absorption of P_2O_5, and TO demonstrates multiphase of structures metal semiconductor based on InP.

VI. CONCLUSION AND FUTURE WORK

In particular points emergence on IR spectrums of a weak strip at 1220 sm^{-1} which it is observed only in a range of IR of absorption of P_2O_5 about multiphase TO it structures of InP also comparison of ranges of IR of absorption which are written down in P polarized light at $\varphi=0\div75^o$ hades (within above told about longitudinally cross splitting of strips multiphase of the analyzed system it has to be shown in nonlinearity of transformation of a range of IR of absorption depending on a hade) testifies and really it is clearly visible that absorption strips at structures of InP at 1090 and 1150 sm^{-1} are displaced to the short-wave area that absorption strips at 1010 and 1220 sm^{-1} remain practically on the place. Not equally changes also intensity of these strips.

REFERENCES

[1]. Gazakov O., ChariyevYa., Orazberdiyev A. "Some electrical properties of diode structures on the basis of Au-InP". FTH. 1985.
[2]. Gazakov O., ChariyevYa., Orazberdiyev A. "Photoelectric properties of the M-n-In_2O_3-(n,p)InP surface barriers structurs". Phys. st. sol. pp. 138-142, 1987
[3]. ChariyevYa., Korotchenkov G., Haydarov P., Bayramgeldiyev N., Kamalov I. "IR spectroscopy and structural and chemical properties of own oxides of phosphide of indium". Theses of reports of a national conference on molecular spectrum analysis. Samarkand. pp. 35, 1996.