28th International conference on Amorphous and Nanocrystalline Semiconductors

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Monday, 5 August 2019

18:20-20:20 Poster Session

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P. Lazarenko, S. Kozyukhin, B. Eszter, A. Sitnikov, V. Glukhenkaya, F. Tamás, D. Seleznev, E. Kirilenko, A. Dedkova, A. Sherchenkov

Charge Exchange at Valence Alternation Pairs in Amorphous Selenium During Transient Optical Excitation and Photocurrent Decay — Mo.Mat.P2
J. Jacobs, S. Kasap, G. Belev, R. J. Curry

Optical properties of amorphous film composites TiO2<Ag>and C-TiO2<Ag> — Mo.Mat.P3
Y. Mukhametkarimov, O. Prikhodko, K. Dauitkhan, S. Mikhailova, U. Doseke, S. Maksimova, K. Tauassarov

Switching effect in thin Ge2Sb2Te5 films modified by silver impurity — Mo.Mat.P4
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Grain Agglomeration in Low Temperature (250°C) Wet Annealed In-Zn-O Films for use in Solution Processed Thin-film Transistors — Mo.Mat.P6
M. P. A. Jallorina, J. P. S. Bermundo, M. N. Fujii, Y. Ishikawa, Y. Uraoka

The Lateral Growth of GeSn Wires on Patterned Si Substrate — Mo.Mat.P7
Y. Zhao , X. Zhang, B. Cheng, S. Feng, Y. Wang, C. Li

Synthesis of Poly-Si Film by Al-Catalyzed Conversion of Silicon Oxide Films — Mo.Mat.P8
J. H. Yoon

Optical properties of nanoscale Ge2Sb2Te5 films modified with Ag and Bi — Mo.Mat.P9
O. Prikhodko, K. Turmanova, Z. Tolepov, A. Zhakypov, A. Sazonov, S. Maksimova, G. Ismailova, S. Mikhailova

High-conductivity P-doped hydrogenated amorphous silicon-germanium (a-SixGe1−x:H) thin-films for thermoelectric — Mo.Mat.P10
C. R. Ascencio-Hurtado, A. Torres, R. Ambrosio, M. Moreno, I. E. Zapata-De Santiago, A. Itzmóyotl

Characterization

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C. Marchat, A. Morisset, J. Alvarez, R. Cabal, M .E. Gueunier-Farret, J. P. Kleider

Nanoscale Study of the Hole-selective Passivating Contacts for High-Efficiency Silicon Solar Cells Using C-AFM Tomography — Mo.Ch
M. Hývl, G. Nogay, F. J. Haug, P. Loper, A. Ingenito, M. Ledinský, C. Ballif, A. Fejfar

Electroformed Silicon Nitride-Based Light Emitting Memory Device Investigated by SEM, EDX and Real-Time Optical Microscopy Analyses — Mo.Ch
M. Anutgan, T. Anutgan, I. Atilgan

Investigation on Luminescent Quantum Efficiencies, Luminescent Stabilities and Ultrafast Radiative Recombination Processes in a-SiNxOy Systems — Mo.Ch
P. Zhang, L. Zhang , F. Lv, R. Cheng, F. Liu, J. Zhang, Y. Li

Alternating Current Implementations of the Moving Photocarrier Grating Technique — Mo.Ch
L. Kopprio, F. Ventosinos, C. Longeaud, J. Schmidt

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The Interpretation of Infrared Spectra of Si-H and/or Si-H2 Groups on Si(111), Si(110) and Si(100) Surfaces — Mo.Ch
J. Šebera, V. Sychrovský, J. Zemen, V. Jirásek, J. Holovský

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S. Nemmour, F. Kail, L. Chahed, P. Roca i Cabarrocas

a-SixGe1−x:H Thermoelectric Thin Film Schottky Diodes: Characterization and Applications — Mo.Ch
I. E. Zapata-De Santiago, A. Torres, C. R. Ascencio-Hurtado, C. Reyes, M. T. Sanz, A. Itzmóyotl

Investigation of ZnO/BST Interface for Thin Film Transistor Applications — Mo.Ch
K. Kandpal, N. Gupta, J. Singh, C. Shekhar

Optical properties of nanoscale $Ge_2Sb_2Te_5$ films modified with Ag and Bi

Oleg Prikhodko[1], Kundyz Turmanova[1], Zhandos Tolepov[1], Alibek Zhakypov[1], Andrey Sazonov[2], Suyumbika Maksimova[1], Guzal Ismailova[1] and Svetlana Mikhailova[1]

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Chalcogenide semiconductor thin films of the Ge-Sb-Te (GST) system have successful application in phase memory devices (Phase Change Memory or PCM), in particular, in optical disks of various formats, such as DVD-RW, Blu-Ray, as well as in the creation of a new generation of PC-RAM random-access memory (Phase Change Random Access Memory). For fabrication of optical devices and rewritable optical disk systems the GST films optical properties are important. These properties control in the GST films is possible by modification them with isovalent metal impurities.

The report presents the results of study the optical band gap (E_g) and optical contrast (*OC*) in nanoscale $Ge_2Sb_2Te_5$ amorphous and crystalline films modified by Ag ($Ge_2Sb_2Te_5$<Ag>) and Bi ($Ge_2Sb_2Te_5$<Bi>).

Amorphous $Ge_2Sb_2Te_5$<M> films with thickness from 80 to 90 nm were obtained by ion-plasma RF magnetron sputtering of a combined target from metal (Ag or Bi) and $Ge_2Sb_2Te_5$ in an Ar atmosphere and by deposition on quartz and c-Si substrates. The composition and thickness of the films were monitored, respectively, by energy-dispersion analysis and scanning the cleavage of c-Si/a-GST<M> on a SEM Quanta 3D 200i. The Ag and Bi concentrations reached 5.0 and 7.3 at. %, respectively. The films were crystallized by annealing at temperature 300 °C.

The spectral dependences of light transmission $T(\lambda)$ and reflection $R(\lambda)$ for the films were recorded on the Shimadzu UV3600 spectrophotometer in the range from 360 to 800 nm. The band gap of the films was determined by the Tauc method. It was found that metal impurity increase leads to a noticeable decrease in the optical band gap in amorphous and crystalline films (**Fig. 1**)

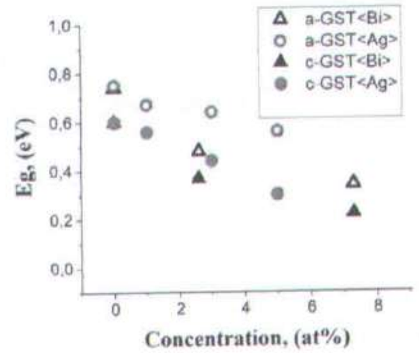

Fig. 1. Optical band gap of amorphous and crystalline $Ge_2Sb_2Te_5$<Ag> and $Ge_2Sb_2Te_5$<Bi> films

The spectral dependence of the *OC* was determined from the expression $OC=\{R_c(\lambda)-R_a(\lambda)\}/R_c(\lambda)$, where $R_c(\lambda)$ and $R_a(\lambda)$ are the reflection coefficients of the crystalline and amorphous films, respectively.

It is found that in the spectral range from 400 to 800 nm the *OC* in $Ge_2Sb_2Te_5$ <Ag> and $Ge_2Sb_2Te_5$<Bi> films significantly differs from that in $Ge_2Sb_2Te_5$ films. In the $Ge_2Sb_2Te_5$<Ag> films OC increase with Ag concentration is observed in the range from 400 to 550 nm, while in $Ge_2Sb_2Te_5$<Bi> films OC rises with Bi in the range from 600 to 800 nm.

Thus, the modification of $Ge_2Sb_2Te_5$ films with silver and bismuth impurity results in significant reduces of the optical band gap. The optical contrast increase with metal impurity concentration in $Ge_2Sb_2Te_5$<Ag> and $Ge_2Sb_2Te_5$<Bi> films occurs in the different spectral ranges.

Keywords: nanoscale $Ge_2Sb_2Te_5$ films, ion-plasma sputtering, modification, transmission, absorption, reflection, optical band gap, optical contrast

Acknowledgments

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