Accepted Manuscript

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PII: S0925-8388(17)31321-X

DOI: 10.1016/j.jallcom.2017.04.122

Reference: JALCOM 41526

To appear in: *Journal of Alloys and Compounds*

Received Date: 3 February 2017

Revised Date: 11 April 2017

Accepted Date: 13 April 2017

Please cite this article as: H. Yin, Y. Liu, L. Li, J. Zheng, H. Zeng, G. Chen, Study of effects of Te addition and oxygen contamination on the surface short range order structure of Ge-Bi-Se glass by XPS, *Journal of Alloys and Compounds* (2017), doi: 10.1016/j.jallcom.2017.04.122.

Study of effects of Te addition and oxygen contamination on the surface short range order structure of Ge-Bi-Se glass by XPS

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Abstract

The short range order structure of $Bi_{13}Ge_{20}Se_{67-x}Te_x$ glasses (x=0, 5, 10, 15, 20 at.%) is explored by using high-resolution X-ray photoelectron spectroscopy. Results show that the incorporated oxygen from surface containment of specimens and Te substitution for Se exert important impacts on the network structure of glasses. Oxygen breaks the Ge-Ge homopolar bonds in the Ge-Se-Bi glass, leading to a significant reduction of the over-constrained Ge-Ge≡$(Se)_3$ ethane-like units. Te addtion promotes the formation of mixed $BiSe(Te)_{3/2}$ nanolayers as crystal precursors, thus initiating crystallinzation in competition to a topological self-organization process. The present work will be helpful to deepen the understanding of ChG glasses for applications in fields of optoelectronics and photonics.

Keywords