
Structuring of chalcogenide glasses thin layers

Miroslav Vlcek^{*1}, Stanislav Slang¹, Karel Palka¹, Liudmila Loghina¹, Anastasia Iakovleva¹, and Marina Grinco¹

¹Center of Materials and Nanotechnologies, Faculty of Chemical Technology, University of Pardubice (CEMNAT) – Studentska 95, Pardubice 532 10, Czech Republic

Abstract

Chalcogenide glasses (ChGs) possess unique properties, e.g. a wide spectral transparency range, low optical losses, high non-linearity of optical properties, which make them very attractive material for applications in optics and optoelectronics [1]. Many of them require ChGs to be structured on micro and/or even nanoscale.

In this paper we give review of techniques suitable for micro and nanostructuring of As and Ge based ChGs thin layers prepared by vacuum evaporation and spin-coating. Due to low rigidity of their structure and low softening temperatures in comparison with oxide glasses their surface can be easily corrugated by direct laser writing method [2] or by embossing [3]. Furthermore ChGs thin layers internal structure can be also easily modified by exposure to suitable radiation (bandgap or UV light, electron or ion beams) [4, 5] resulting in changes of their chemical resistance. Both positive as well as negative high selective etching resulting in thin layers structuring can be achieved by consequent treatment in alkaline solutions. Influence of various parameters (thin layers composition, method of their fabrication, thermal prehistory, alkaline solution composition and concentration) on quality of CHGs thin layers structuring is discussed. Examples of practical application of micro and nanostructuring of CHGs are also given.

Reference

J-L Adam (Editor), X. Zhang (Editor), *Chalcogenide Glasses: Preparation, Properties and Applications*, Woodhead Publishing (2013)

I. Voynarovych, S. Schroeter, R. Poehlmann, M. Vlcek J. Phys. D: Appl. Phys. 48 (2015) 265106 (9pp)

M. Kalyva, A. Siokou, S. Yannopoulos, T. Wagner, J. Orava, M. Frumar, J. Non-Cryst. Solids 355 (2009) 1844 – 1848

S. Slang, K. Palka, M. Vlcek Journal of Non-Cryst. Solids 471 (2017) 415–420

I. Voynarovych, J. Buzek, K. Palka, M. Vlcek (2016) Thin Solid Films, 608, 8-15

Acknowledgements

Authors appreciate financial support from project No. 16-13876S financed by the Grant

^{*}Speaker

Agency of the Czech Republic (GA CR), support from the grants LM2015082 and ED4.100/11.0251 from the Ministry of Education, Youth and Sports of the Czech Republic and European Regional Development Fund-Project "Modernization and upgrade of the CEMNAT" (No. CZ.02.1.01/0.0/0.0/16_013/0001829).

Keywords: chalcogenide glasses, nanostructuring, microstructuring