Synthesis and Physical Property Investigation of Glassy Azobenzene Derivatives

Elmars Zarins[1], Andrejs Tokmakovs[2], Valdis Kokars[1], Martins Rutkis[2], Andris Ozols[1], Peteris Augustovs[1], Valdis Kampars[1]
[1]*Riga Technical University,*
[2]*University of Latvia*

Keywords **– molecular glasses, SRG, NLO, holographic gratings, azobenzene.**

INTRODUCTION

Low molecular mass organic compounds with electron donating fragment bounded through π-conjugated azobenzene system with electron acceptor fragment, as well as with incorporated triphenyl groups in their molecules show potential for creating materials for organic photonics, such as materials for nonlinear optical (NLO) applications and holographic data storage with cheap and simple deposition from volatile organic solvents [1-3]. Therefore, it is important to carry out more studies on the relation of the structure of organic compounds with their physical properties. In order to investigate the above-mentioned regularities, we have synthesised and investigated the physical properties of several molecular glassy azobenzene compounds **M** shown in Figure 1, where electron acceptor part of the molecule also contains structural fragments X.

EXPERIMENTAL RESULTS

We investigated optical, thermal, glass-forming, nonlinear optical and surface relief grating formation properties of azobenzene derivatives **M.** If several synthesised compounds **M** contain the same part of the electron acceptor (A) fragment in their molecules, then the above-mentioned physical properties are mostly influenced by the structural fragment X. Synthesised compound absorption maxima in the solution of dichloromethane varied from 450 nm to 530 nm, and from 480 nm to 550 nm in their thin solid films. NLO efficiencies d_{33} of up to 125.7 pm/V and holographic diffraction efficiency of up to 20% were obtained.

Thermal characteristics of compound **M**: thermal decomposition values ranged from 250 °C to 320 °C and glass transition values – from 70 °C to 180 °C. We found that the most perspective organic compounds for applications in organic photonics were with X = 5,5-dimethyl-1-styryl-cyclohex-2-enylidene fragment, A = malononitrile and D contained two triphenylmet groups. Detailed research results will be presented at conference.

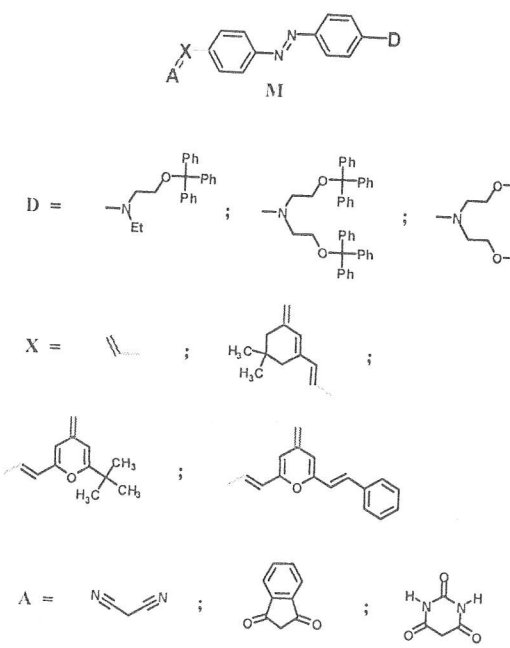

Figure 1. Synthetic variations of glassy azobenzene derivatives

REFERENCES

[1] Traskovskis K., Mihailovs I., Tokmakovs A., Jurgis A., Kokars V., Rutkis *J. Mater. Chem.*, **2012**, *22*, 11268.
[2] Zarins, E.; Kokars, V.; Ozols, A.; Augustovs, P. *Proc. SPIE.*, **2011**, *8076*, 80740E-1-80740E-6.
[3] Zarins, E.; Tokmakovs, A.; Kalina, Z.; Kokars, V.; Ruktis, M., Ozols, A.; Augustovs, P.; Lazdovica, K.; Kampars, V. *Proc. SPIE.*, **2013**, *8622*, 86221H-1-86221H-12.