PRACE NAUKOWE Wyższej Szkoły Pedagogicznej w Częstochowie
Seria: FIZYKA z. IV, 2001

M.F. YASINSKII
Ukrainian Academy of Printing, Pidholosko 19, 290020 Lviv, Ukraine

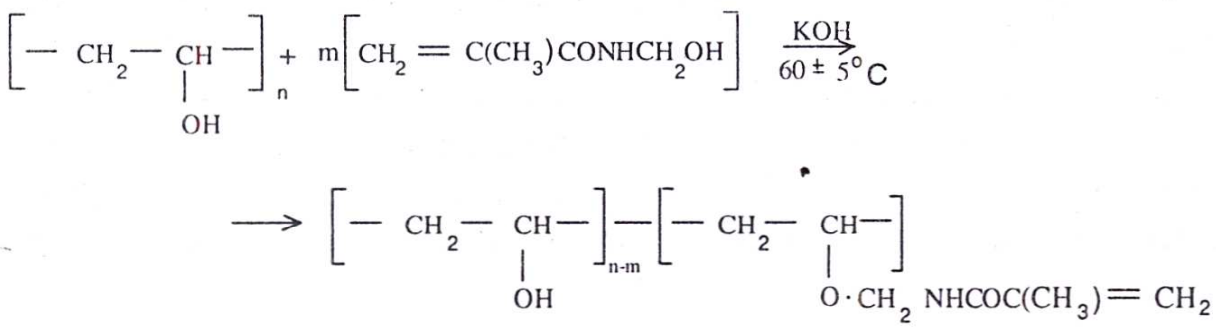
Photoacoustical Investigations in the Modified Polivinyl Alcohole Photopolymers

Investigations of the photoacoustical spectra for the modified polivinyl alcoholes within the spectral range 1.6 ... 6.2 eV have been carried out.

Recently one can observe an increasing interest to different organic acoustoelectronics materials on the basis of organic materials [1]. One of an interesting application of the materials is connected with the appearance of the nonlinear optical effects, when the output photoacoustical response is dependent on the light power [2]. One of an effective way to improve their properties consists in a modification of the existed materials by introducing of additional chemical groups changing their polarizability and the output nonlinear optical response. The polyvinyl alcohol materials seem to be promising from this point [3].

The polivinyl alcoholes (PVA) possess good acoustooptical as well electrooptical properties [4]. At the same time they are photopolymers. As a consequence operating by the photopolymerization (solidification) one can vary their optical properties. Moreover the photopolymerised materials possess higher optical homogeneity and large nonlinear optical susceptibilities [5].

The synthesis of the mentioned photopolymers was performed by the following chemical reaction schema [3]:



The solid photopolymers were obtained by the illumination of the mentioned photocompositions by the UV-hydrogenous lamp light of the power about 45 Wt/cm^2 with the different UV – exposure time. Our previous investigations have shown that the optimal exposure time for the samples PVA-MPA lies within the 5 ... 7 min.

Measurements were carried out using the YAG:Nd laser as a source of the light. Electromechanical modulator with the frequencies within the 20 ... 400 Hz was used for light modulation. In-lock ampflier was synchronized with the photodetector FEU-79. Variation of the spectral range was achieved using the BBO single crystals as materials for continuous variation of the wavelength.

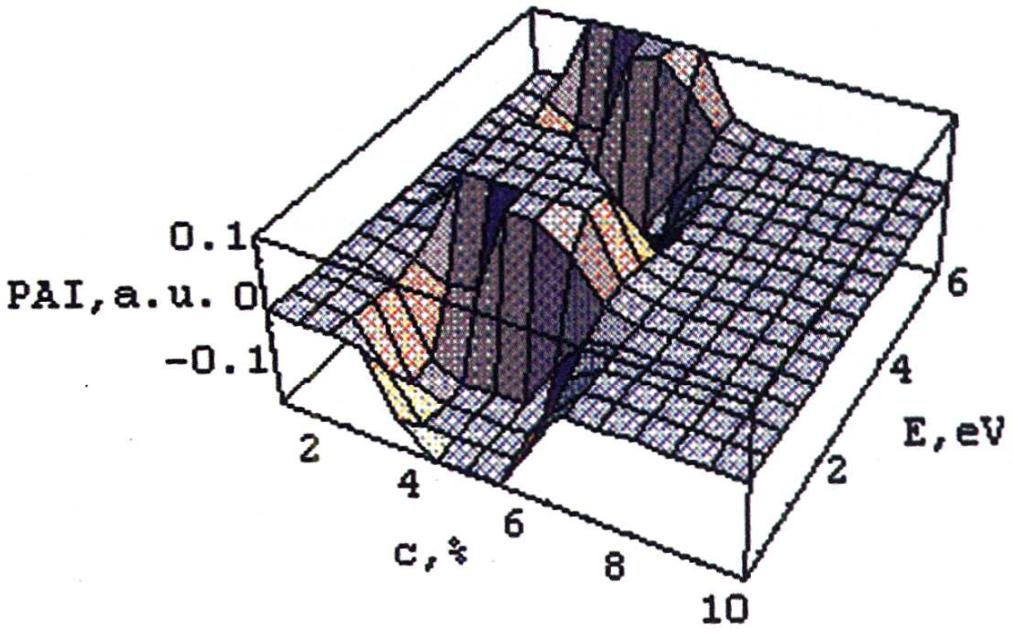


Fig. 1. Dependence of the photoacoustical intensity as a function of the modified components concentration and of the spectral energy

From Figure 1 one can clearly see that the essential increase of the PAI signal is achieved at modifier concentrations within the 2 ... 6% and for the spectra energies within the 3.5 ... 4.4 eV as well the 5.5 ... 6.2 eV. Such situation indicates on the possible modifications of the mentioned polymers as a promising materials for the photoacoustical devices. The corresponding investigations are now in progress and the devices are expected in the near future.

References

[1] I.V. Kityk, Materials for polymer optics. Hwang-Chu ed. 1997, Sin-ghu Press, 231 p.; I.V. Kityk, B. Sahraoui, J. Berdowski, Proc. SPIE, **2876**, 142 (1999).

[2] B. Sahraoui, I.V. Kityk, J. Berdowski, J. Kasperczyk & M.F. Yasinskii, Nonlinear Optics **19**, 341–347 (1999); E.W. Hanses, K.H. Holm, D.M. Jahr, K. Olafsen and Aa.Stori. Polymer N19, **38**, 4863–4871.

[3] I.V. Kityk, J. Kasperczyk, B. Sahraoui, M.F. Yasinskii & B. Holan. Polymers, N19, **38**, 4803–4806 (1997).

[4] J. Sanetra, J. Nizioł, P. Armatys, R. Chrząszcz, S. Nizioł, I. Kityk, and A. Mefleh, Nonlinear Optics **21**, 535–542 (1999).

[5] I.V. Kityk, M.F. Yasinskii, Ukrainiaan Polymer Journal, **3**, 235–239 (1995).