Reply to Comment on 'Optical poling of oligoether acrylate photopolymers doped by stilbene-benzoate derivative chromophores'

2005 J. Phys.: Condens. Matter 17 1765

(http://iopscience.iop.org/0953-8984/17/10/N02)

INSTITUTE OF PHYSICS PUBLISHING JOURNAL OF PHYSICS: CONDENSED MATTER

J. Phys.: Condens. Matter **17** (2005) 1765–1766 doi:10.1088/0953-8984/17/10/N02

REPLY

Reply to Comment on 'Optical poling of oligoether acrylate photopolymers doped by stilbene-benzoate derivative chromophores'

I V Kityk[1], E Gondek[2], L Krzeminska[2] and A Danel[2]

[1] Institute of Physics, J Dlugosz University of Czestochowa, Al. Armii Krajowej 13/15, Czestochowa, Poland
[2] Institute of Physics, Technical University of Krakow, ul. Podchorazych 1, Krakow, Poland

Received 26 August 2004, in final form 5 January 2005
Published 25 February 2005
Online at stacks.iop.org/JPhysCM/17/1765

Abstract

Optical poling in photopolymers has several principal differences compared to other guest–host composites. There exists a principal difference between aligning the DC electric field presented in the article and interior DC electric strength. Also, the use of the hyperpolarizabilities of different orders is clarified.

After careful consideration of the Comment as well as additional remarks made by the referee, we see that there has been some misunderstanding as regards the meaning of the 'DC electric field'. So we have provided an erratum which clarifies the origin of the DC electric field, which appears in this issue.

From the material presented, it is clear that the aligning DC electric field indicates values which are similar to ones given in many articles, obtained by other authors (see for example the relatively recent [1]). Evaluation of the optically poled electric field is the subject of a separate study, which will be published in the future and presented a more complicated task. It is clear that the value of this internal electric strength field should be completely different.

As regards the mechanisms of optical poling in photopolymers, they seem to be substantially different from those for other kinds of polymers; however, more details require more room and this cannot be explained within the framework of a Reply to Comment. We can say that our work is, to the best of our knowledge, the first in which optical poling was investigated in the photopolymer matrices. The main difference consists in the photosolidification of the polymers.

As regards the remarks about the second-order hyperpolarizabilities or second-order microscopic susceptibilities—that means that the effect is described by fourth-rank tensors which are proportional to the third-order macroscopic susceptibility. It is only a difference in terminology. Usually the first-order hyperpolarizability is used to describe second-order macroscopic effects such as second-harmonic generation and the linear electrooptics

effect, and the second-order hyperpolarizability (microscopic second-order nonlinear optical susceptibility) corresponded to the macroscopic third-order susceptibility. Sometimes this terminology in the literature is mixed up.

References

[1] Yu H H and Hwang S-J 2003 *Opt. Commun.* **219** 183