

광학 2차 고조파에 의한 Organic FET의 캐리어 거동현상과 Modeling

Mitsumasa Iwamoto

물리전자공학과, 일본 동경공업대학

PROBING AND MODELING OF CARRIER MOTION IN ORGANIC FIELD EFFECT TRANSISTOR BY OPTICAL SECOND HARMONIC GENERATION

Mitsumasa Iwamoto

Department of Physical Electronics, Tokyo Institute of Technology

Abstract

From view point of dielectrics physics, carrier motion in organic field-effect transistors (OFETs) is analyzed as a system of Maxwell-Wagner effect element. [1, 2]. Results show that this analysis well accounts for the transfer characteristics of OFETs.

We then report a novel optical second harmonic generation (SHG) measurement that allows an electric field formed in organic solid to be probed [3]. It is shown that the SHG intensity profile changes depending on electric field formed in organic materials [4]. Experiments making use of time resolved SHG technique has revealed dynamic changes of SHG intensity profiles arising from pentacene [5], and that carrier transport in OFET was diffusion-like. Calculations using drift-diffusion equation well accounted for the visualized carrier motion probed by time-resolved SHG [6].

Finally, we conclude that experiments and analysis based on dielectrics physics is a very effective way for analyzing carrier behaviors in organic materials as well as in organic thin film devices.

[참 고 문 헌]

- [1] R. Tamura, E. Lim, T. Manaka, and M. Iwamoto, J. Appl. Phys. 100,114515(2006).
- [2] E. Lim, T. Manaka, M. Iwamoto, J. Appl. Phys. 104, 05 4511 (2008).
- [3] T. Manaka, E.Lim,R.Tamura,D.Yamada and M. Iwamoto, Appl. Phys. Lett. 87,072113(2006).
- [4] E. Lim, T. Manaka, and M. Iwamoto, J. Appl. Phys. 101,024515(2007).
- [5] T. Manaka, E. Lim, R. Tamura and M. Iwamoto, Nature Photon. 1,581(2007).
- [6] T. Manaka, F. Liu, M. Weis and M. Iwamoto, J.Phys.Chem. in press (2009).