DEFECT-RELATED PHOTOLUMINESCENCE OF C_{60} THIN FILMS: EFFECT OF STRAINS AND TEMPERATURE

V.N.Zoryansky[a], A.Avdeenko[a], N.Churakova[b], V.Eremenko[a], N.Gorbenko[b], A.Pugachev[b], N.Silaeva[a], and P.Zinoviev[a]

[a]Verkin Institute for Low Temperature Physics and Engineering, National Academy of Sciences of Ukraine, 47 Lenin Avenue, Kharkov 61103, Ukraine

[b]Kharkov State Polytechnic University, 21 Frunze Str., Kharkov 61002, Ukraine

The results of studies of low temperature photoluminescence of C_{60} thin films fabricated by the deposition in vacuum on the heated up substrates (NaCl crystalline plate, mica) are presented. The films structures was analyzed by standard transmission high energy electron diffraction (THEED) technique. The structure analysis showed that the structure of films depend on a deposition rate, substrate temperature, and film thickness. Earlier [1 - 4] the supposition was put forward that structural defects play the important role for shaping of C_{60} photoluminescence spectrum. For clearing up of a nature of defects, researches of the effects of temperature and strains on photoluminescence spectra were conducted. The structural defects originated both as because of difference of C_{60} thin film thermal expansion coefficients and because of a bending of C_{60} thin film deposited on mica.

Influence of strains was observed on the 1.76 and 1.71 eV defect-related photoluminescence bands (see Figure). The features of a temperature behavior of the 1.76 and 1.79 eV photoluminescence bands are also investigated. Processes of defects formation and electronic excitations trapping are discussed.

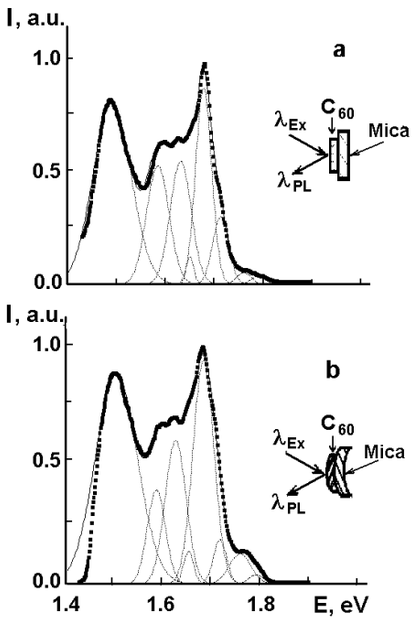

Figure. Photoluminescence spectra of C_{60} thin epitaxial film of 90 nm thickness deposited on mica:
a - plane specimen, **b** - bent specimen.
I is a photoluminescence intensity in arbitrary units, **E** is a light energy in eV. Photoluminescence was excited by the 2.27 eV radiation at 5K, the curves were fitted by Gaussians.

References.

1. W. Guss, J. Feldmann, E.O. Göbel, C. Taliani, H. Mohn, W. Müller, P. Häussler, H.-U. ter Meer. Phys. Rev. Lett. **72,** 2644 (1994).
2. J. Akimoto, M. Achida, K. Kan'no. Chem. Phys. Lett. **292**, 561 (1998).
3. A.A. Avdeenko, V.V. Eremenko, P.V. Zinoviev, N.B. Silaeva, Yu.A. Tiunov, N.I. Gorbenko, A.T. Pugachev, N.P. Churakova. Low Temp. Phys. **25**, 37 (1999).
4. M. Ichida, S. Tanaka, A. Nakamura. Solid State Communs. **116**, 615 (2000).