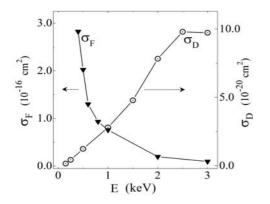
Analysis of electron-induced fullerite C₆₀ modification in terms of destruction cross-section

Shnitov V.V.*, Mikoushkin V.M.

Ioffe Institute, 194021, St. Petersburg, Russia *e-mail: v.shnitov@mail.ioffe.ru

Despite the noticeable number of the works investigating electron beam induced destruction of individual fullerenes C_{60} [1] and respective modification of solid fullerite C_{60} [2,3], some important aspects of this process is still weakly studied. In particular, a widely accepted model considering e-induced destruction of solid fullerite as a successive fragmentation of non-interacting fullerenes [2], has, in our opinion, insufficiently reliable experimental verification and incorrectly interprets basic mechanisms of this process.

The aim of present work was to check the validity of above mentioned model by comparison of a well-established energy dependence of cross-section $\sigma_F(E)$ [1] describing e-induced fragmentation of individual fullerenes C₆₀ with respective dependence of effective cross-section $\sigma_D(E)$ specifying destruction of solid fullerite C₆₀. The last cross-section was obtained in this work on the basis of the electron energy loss spectroscopy (EELS) and special processing technique using some peculiarities of fullerite EEL spectra and suggested in our early work [3]. Both cross-



Experimental cross-sections of e-induced fragmentation of separate fullerenes C_{60} (σ_F), taken from [1] and of e-induced destruction of solid fullerite C_{60} (σ_D), obtained in this work.

sections are shown in the inserted figure. demonstrate completely different They which reveals behavior, not only in substantial from 5 to 2 orders of magnitude difference between their absolute values, but also in obviously inverse types of their energy dependencies. These facts allowed us to conclude that real e-induced destruction of solid fullerite C_{60} drastically differs from hypothetic one predicting by the model of successive fragmentation of separate fullerenes [2] and that this model is indeed invalid. They also indicate that radiation stability of condensed fullerenes C_{60} appeared to be radically higher than it follows from the model of non-interacting

assembly of fullerenes and than it was expected earlier.

The research was supported by the Russian Foundation for Basic Research (RFBR) Project N_{2} 10-07-00508-a, by Presidium of RAS Program and by the St. Petersburg Joint Research Center "Material science and diagnostics in modern technologies" equipment.

- [1] Itoh A., Tsuchida H., Miyabe K., Majima T., Imanishi N., J. Phys. B. 32, 277 (1999).
- [2] Hunt M.R.C., Schmidt J., Palmer R.E., Phys. Rev. B. 60, 5927 (1999).
- [3] Shnitov V.V., Mikoushkin V.M., Bryzgalov V.V., Gordeev Yu.S., *Phys. Sol. St.* **44**, 444 (2002).