

INTERBAND OPTICAL TRANSITIONS IN SOLID C₆₀ FULLERENES, ALLOYED BY CADMIUM WITH THE RADIATION DAMAGES

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Introduction

The alloying of solid C₆₀ fullerenes by alkaline metals depending on their stoichiometric compositions substantial influences their conductivity, that finds its manifestation even in its type change [1]. It is obvious that this change in the electrical properties is the result of reconstruction with the alloying of the electron structure of C₆₀ fullerites. It is connected with the transfer of charges from the alkaline metals to fullerenes. This transfer of charges also occurs with the alloying of solid C₆₀ fullerenes by other elements, for example, by the molecules of oxygen and atoms of copper [2]. In this case oxygen is the electron acceptor, and copper atoms are their donors. The charge, which is transferred from the copper atoms, substantially exceeds that, which is observed in the case of alloying by the alkaline metals [3].

In connection with this the investigation of influence on the electron structure of C₆₀ fullerenes with different alloying atoms, in particular cadmium atoms, especially with the atomic displacement of carbon to the interstitial positions of crystal lattice as a result of radiation damages of the C₆₀ molecules is of interest.

Results and discussion

The study of electron structure was carried out by the method of spectral ellipsometry in the field

of existence of interband transitions for the Cd-C₆₀ films, irradiated by the argon ions with the energy of 1 KeV in the plasma of the glow discharge at the following currents: 3,5 mA - (30 min), 7 mA -(35 min).

It was found that even with the small fluences of irradiation the suppression of the bands of high-frequency optical conductivity $\sigma(\omega)$ is observed. With an increase in the absorption dose the $\sigma(\omega)$ band near 4,5 eV decreases more substantially than the optical conductivity bands, which adjoins to the energy gap. These results testify about the noticeable decrease of electronic concentration in the s-states of C₆₀ fullerenes with the accumulation of the displaced carbon atoms in the crystal lattice.

References

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