THE FEATURES OF LUMINOPHORE USE IN LIGHT SOURCES WITH THE COLD CATHODE

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Introduction

Carbon nanotubes of various modifications, received by various methods, have various chemical, physical, magnetic and also electrical properties. The last-mentioned are especially important in connection with impetuous development of microelectronics and its gradual transition to nano-sized elements.

Carbon nanostructures occupy the special place in the field of development of emissive of devices. They are used in field emitters, for back illumination of liquid crystal displays, in displays suitable for outdoor use, for road signs, in light sources with cold cathodes and others light-generating devices.

In present paper we shall enlarge in more detail on light sources with cold cathodes, just on that part of a light source, which, accepting electrons from nanostructural of carbon emitters, emit the light. In principle this material is the substance, by glow of which it is possible to judge visually about the quality of emission or emission opportunities of cathode (not including a current, voltage and other well-known parameters). The luminous efficiency of all light-emitting device depends in many respects on material.

Discussion

At luminescence the system loses energy and for compensation of these losses it is necessary to supply with energy from the outside. The varieties of luminescence are classified as an external sources of energy. In our case electrons, emitted by the cathode are energy source. This type of emission is identified as cathode-luminescence.

The tolerant systems with prolonged persistence and high quantum output will be more suitable for production of effective light sources with cathodes based on carbon nanotubes. They are solid inorganic phosphors, the phosphorescence of which is connected with formation of electron trapping sites (traps), for example, zinc sulphide with copper, zinc, aluminium, gallium, tellurium, manganese as activators and sulphideselenide of zinc-cadmium.

At excitation electron passes from valence band in to the conduction band of crystal. The return of electron to the valence band is accompanied by the emission of light, which is known as phosphorescence. It is possible also the electrons capture in the trap arised on impurity sites of crystal. The trapped electron can be carried back to the conduction band by increase of temperature or excitation by infrared light.

Sometimes after energy absorption the atom of activator is excited to the energy state, which is below the conduction band. The electrons transitions from this state are accompanied by fluorescence, or by their capture by defects of crystal lattice, which can emit by itself. In result there is a so-called slowed-down fluorescence.

Many of organic substances have molecular phosphorescence, related to the isolated molecule. The long time of life of this type phosphorescence is caused by the forbidden transition T_1-S_0 (in inorganic phosphors by electrons capture in traps). Both of these types of phosphorescence have common features: long time of life and excitation through an intermediate state.

But organic phosphors, as a rule, have no such stability to external action, as inorganic, and also semiconductor properties.

Conclusions

In view of results of preliminary investigations it is necessary to note, that for electrons energy conversion into visible light in diodes with nanostructural carbon cathodes it is possible to use inorganic luminophors based on sulphides and selenides of zinc and cadmium with copper, aluminium, gallium, silver as activators.

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