Optimization of Parameters of a Matrix Triode with Nanotube Cathode

Zoia Kosakovskaya,[1] Alexander Iarochenko,[2]
Sergey Vaniushkin[1] and Sergey Matyunin[1]

[1]Institute of Radio Engineering and Electronics of RAS
Mokhovaya str., 11,
Moscow 101999
Russia

[2]Nanotech Innovations Corp
87 Scollard St.
Toronto, On M5r 3B9
Canada

Due to good emission characteristics, high chemical stability and mechanical strength, carbon nanotubes are successful material for creation of cathodes of flat monitors with low voltage and low-consumable power. In order to have opportunity of high quality displaying of moving objects, it is necessary to create a display of triode type, which has a matrix cathode out of carbon nanotubes, integrated with the controlling electrode [1].

In this work, impact of geometric dimensions of an elementary cell of a matrix triode structure on its work modes was investigated. This has allowed us to find optimal geometry of a triode with matrix cathode and to determine optimal work modes of the triode, during which a confident control of emission current is possible.

During development of approaches to solving the defined task, it was considered that typical dimensions of a system cathode gate (mm) are two-three degrees larger than typical transverse dimension of nanotube sources of emission (nm).

In order to optimize geometric dimensions and work modes of an elementary cell as well as of the entire matrix triode, the following problems were solved:

1. Impact of geometric dimensions “Nanotube cathode controlling electrode” on distribution of emission current density of an elementary cell of matrix triode was investigated.

2. Using experimentally measured volt-ampere characteristics of a diode with a cathode made of carbon nanotubes, dependencies of distribution of the current density of anode-phosphor from the potential of the controlling electrode with various values of geometric parameters of elementary cells in the matrix of triode were calculated.

3.Maximum density of elementary cells in the matrix of triode was determined.

The obtained results will be discussed.

References

1. G. Pirio, P. Legagneux, D. Pribat et.al. Nanotechnology 13, 2002, 1 - 4