CNTs and CNT/ZnO Nanostructures for Use as Electron Sources

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The aim of this paper is to describe the growth and optimization of carbon nanotube (CNT) and CNT/Zinc Oxide nanostructures to produce novel electron sources. The emitters studied in this project are based on regular array of vertically aligned 5 μm height and 50 nm diameter CNTs with a pitch of 10 μm as described previously (1). Such a cathode design allows us to minimize electric field shielding effects and thus to help in optimizing the emitted current density. We have previously obtained a current density of 1 A/cm^2 from such arrays in DC mode, and over 12 A/cm^2 in pulsed mode at RF frequencies.

In order to attain the large current densities with reasonable uniformities and long life time required for many applications it is necessary to prevent the best CNT emitters in the array from emitting a current larger than the current which induces their destruction (around 100 μA). To solve this problem, a ballast resistor needs to be integrated. In this paper we will describe our recent work in this area including the use of a novel CNT/ZnO nanostructure as shown in Figure 1.

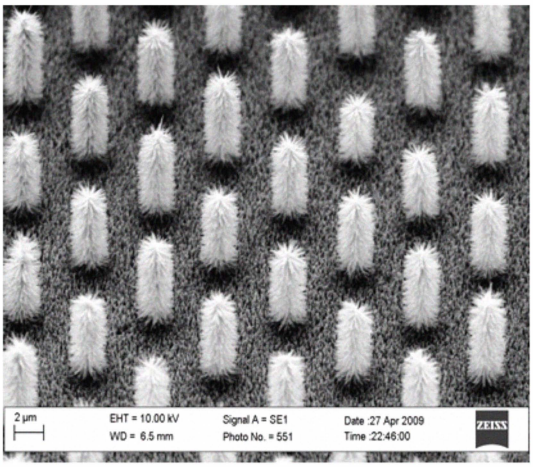

Figure 1 ZnO/CNT nanostructure

References

1. Field electron emission from individual carbon nanotubes of a vertically aligned array V. Semet et al., Appl. Phys. Lett. **81**, 343 (2002)

978-1-4244-6644-3/10/$26.00 ©2010 IEEE