

Fabrication of field emitters using a filtration-taping-transfer method

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There have been several methods to fabricate carbon nanotube (CNT) emitters, which include as-grown, spraying, screen-printing, electrophoresis and bonding methods. Unfortunately, these techniques generally suffer from two main problems. One is a weak mechanical adhesion between CNTs and the cathode. The as-grown, spraying and electrophoresis methods show a weak mechanical adhesion between CNTs and the cathodes, which induces CNT emitters pulled out under a high electric field. The other is a severe degradation of the CNT tip due to organic binders used in the fabrication process. The screen-printing method which is widely used to fabricate CNT emitters generally shows a critical degradation of CNT emitters caused by the organic binder. Such kinds of problems induce a short lifetime of the CNT field emitters which may limit their practical applications. Therefore, a robust CNT emitter which has the strong mechanical adhesion and no degradation is still a great challenge.

Here, we introduce a simple and effective technique for fabrication of CNT field emitter, namely filtration-taping-transfer method. The CNT emitters fabricated by the filtration-taping-transfer method show the low turn-on electric fields, the high emission current, good uniformity and good stability. The enhanced emission performance of the CNT emitters is mainly attributed to high emission sites on the emitter area, and to good ohmic contact and strong mechanical adhesion between the emitters and cathodes. The CNT emitters using a simple and effective fabrication method can be applied for various field emission applications such as field emission displays, lamps, e-beam sources, and x-ray sources. The detail fabrication process will be covered at the poster.

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