
Fabrication of carbon nanotube fibers with nanoscale tips and their field emission properties

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Carbon nanotubes (CNTs) have been considered as one of the promising candidate for next-generation field emitters because of their unique properties, such as high field enhancement factor, good mechanical strength, and excellent chemical stability. So far, a lot of researchers have been interested in field emission properties of CNT itself. However, it is necessary to study proper field emitter shapes, as well as the fundamental properties of CNTs, to apply CNTs to real devices. For example, specific applications, such as x-ray sources, e-beam sources, and microwave amplifiers, need to get a focused electron beam from the field emitters. If we use planar-typed CNT emitters, it will need several focal lenses to reduce a size of electron beam. On the other hand, the point-typed CNT emitters can be an effective way to get a focused electron beam using a simple technique.

Here, we introduce a fabrication of CNT fibers with nanoscale point tips which can be used as a point-typed emitter. The emitter made by the CNT fibers showed very low turn-on electric field, high current density, and large enhancement factor. In addition, it showed stable emission current during long operation period. The high performance of CNT point emitter indicated the potential e-beam source candidate for the applications requiring small electron beam size.

Keywords: carbon nanotube, field emission, point emitter