



Contribution ID: 32

Type: Oral

Enabling Bright Carbon Nanotube Fiber Field Emission Cathode

Tuesday 20 September 2022 15:00 (30 minutes)

In this work, we introduce a new technique which improves emittance of the carbon nanotube fiber field emission cathode (CNT fiber FEC) many-fold. CNT fibers remain of high interest for next generation electron source research and development as they have low turn-on voltage, high conductivity, durability, and flexibility. However, control over its emission properties is a challenge. Our previous studies showed that formation of stray emitters due to thermal and field stress during emission causes spatially non-coherent beam, which means large emittance and low brightness. It was also shown that the emission over the surface was confined to small number of stray spots, which makes most of the surface useless and leads to local hot spots, arcs, and failure of the cathode.

To prevent formation of stray emitters, we electroplated fiber ropes, made of multiple twisted CNT fibers, with nickel, then cut its top with a femtosecond laser to minimize surface ablation, and welded it on a metal base. The final structure has 150 μm fiber core, 50 μm thick Ni shell, and is 4.8 mm in height. Our emission test results showed that emission from the cathode forms a single spot comparable to the entire size of the cathode fiber core and high output current. This is an indication of high brightness and emission uniformity over the surface. Detailed results and brightness estimations will be presented.

Topic

Field Emission

Authors: POSOS, Taha Y. (Michigan State University); COOK, Jack (University of Cambridge); BARYSHEV, Sergey V. (Michigan State University)

Presenter: POSOS, Taha Y. (Michigan State University)

Session Classification: Field Emission

Track Classification: Field emission