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In-situ TEM study on structural changes of Ag-incorporated carbon nanofiber during field emission process.

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Introduction: 1-D carbon nanomaterials such as carbon nanotubes (CNTs)[1] and carbon nanofibers (CNFs)[2] have an excellent mechanical and electrical properties and high aspect ratio. Therefore, they are promising materials for various applications such as emitter for field emission devices. Many efforts have been put to study their characteristics using bulk of CNTs / CNFs. However, only a few experiments have been performed to observe the individual CNT/CNF directly[3]. In this work, we will investigate the structural changes and electrical properties of an individual Ag-incorporated CNFs during field emission process.

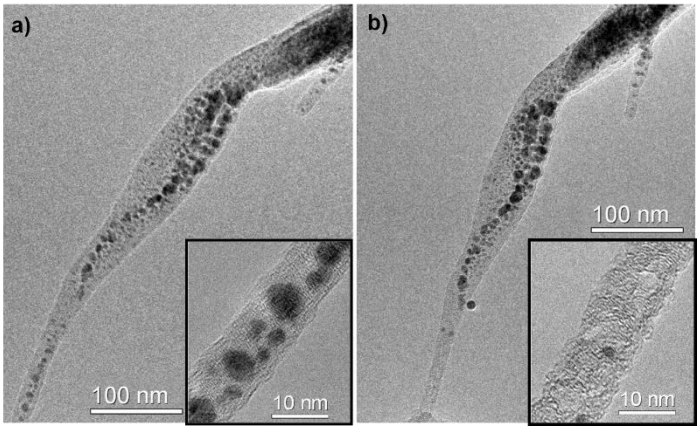

Fig. 1 Typical TEM images of Ag-incorporated CNF (a) before field emission and (b) after field emission process.

Experiment: Ag-incorporated CNFs were fabricated on the edge of a graphite foil using "Ar^+ ion sputtering method" at room temperature[4] with a simultaneous supply of Ag particles during ion irradiation. The basal and working pressures of the chamber were 1×10^{-5} Pa and 5×10^{-2} Pa respectively. Field emission properties for the individual Ag-incorporated CNF were measured by in-situ TEM method under 10^{-5} Pa range of pressure.

Results: Before the field emission, the Ag-incorporated CNFs were in polycrystalline/amorphous structure [Fig. 1(a)]. During field emission process, the incorporated Ag particles were evaporated and migrated to the side of the fiber [Fig. 1(b)]. Field emission properties for the fiber will be discussed in the presentation.

References:

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