감광성 CNT paste에 대한 저에너지 Ball Milling 처리 효과

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Effect of Ball Milling on Photosensitive Carbon Nanotube Pastes and Their Field Emission Properties

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Abstract : Although the screen printing technology using photosensitive carbon nanotube (CNT) paste has many advantages such as low cost, simple process, uniform emission, and capability of mass production, the CNT paste needs to be improved further in CNT dispersion, printability, adhesion, electrical conductivity, population of CNT emitters, etc. Ball milling has been frequently employed to prepare the CNT paste as ball milling can mix its ingredients very well and easily cut the long, entangled CNTs. This study carried out a parametric approach to fabricating the CNT paste in terms of low-energy ball milling and a paste composition. Field emission properties of the CNT paste was characterized with CNT dispersion and electrical conductivity which were measured by a UV-Vis spectrophotometer and a 4-point probe method, respectively. Main variables in formulating the CNT paste include a length of milling time, and amounts of CNTs and conductive inorganic fillers. In particular, we varied not only the contents of conductive fillers but also used two different sizes of filler particles of μm and nm ranges. Among many variations of conductive fillers, the best field emission characteristics occurred at the 5 wt% fillers with the mixing ratio of 3:1 for μm- and nm-sizes. The amount and size of fillers has a great effect on the morphology, processing stability, and field emission characteristics of CNT emitter dots. The addition a small amount of nm-size fillers considerably improved the field emission characteristics of the photosensitive CNT paste.

Key Words : Carbon nanotube, field emission, photosensitive paste, ball milling, conductive inorganic filler