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Field Emission Comparison between Nanotubes and Nanowires

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Field emission characteristics of carbon nanotubes and other nanowires have been compared by examining turn-on field, emission current density, stability, etc. GaN, GaP, SiO2, ZnO, and organic (PEDOT, PPV) nanowires have been synthesized by various methods such as chemical vapor deposition or deposition within anodic alumina nanotemplates. Overall carbon nanotubes exhibit better performance in field emission than nanowires. However, emission stability of GaP nanowires, which have natural oxide thin layers on the surface of nanowires after synthesis, is very good as much as insulator-coated nanotubes preventing several order of magnitude current decrease under the oxygen environment. In addition, by measuring energy distribution of emitted electrons from ZnO nanowires, the origin of emitted electrons are clarified, confirming the different emission mechanism between conducting and semiconducting nanostructures.