

Name of the Scholar : **Mohammad Moeen Hasan Raza**
Name of the Supervisor : **Dr. Javid Ali**
Name of the Department : **Department of Physics**
Topic of Research : **Synthesis of Carbon Nanotubes and Enhancement of Their Field Emission Properties**

Finding

Carbon nanotubes are the 21st century novel materials. They are the one-dimensional fullerene structure of carbon. CNTs have variety of potential application in many fields such as field emission display, super-capacitor, sensors, and battery anode materials, etc. CNTs have the superior electronic, thermal, and mechanical properties due to their atomic configuration in hexagonal lattice. The π - π bonding between the carbon atoms is accountable for their advanced electrical properties. In this Ph.D. work, we have synthesized the CNT and improving their field emission properties. The field emission properties were improved by applying the two different approach such as metal oxide nanoparticle decoration / attachment, and plasma treatment – time dependent and power dependent. The turn-on (E_{to}) and threshold (E_{th}) fields drastically reduced after the metal oxide nanoparticle decoration (*ex-situ* approach) and attachment (*in-situ* approach). The field enhancement factor improved after the decoration and attachment process. The surface morphology of the CNT field emitters was also modified by the time and power dependent plasma treatment process. In which the screening effect reduced and improved the field emission parameters such as E_{to} , E_{th} , J and β . The emission stability also improved with the time-dependent treatment process. Now, when the CNT field emitters treated with the plasma-power dependent the reduction in the E_{to} and E_{th} fields and increment in the J (emission current density) is observed due to the reduction of the screening effect. The plasma treatment basically enhanced the emission sites by the surface etching process on the nanotube surface in terms of the defects and vacancies. The emission stability also improved with respect to plasma power and plasma time treatment process. When the metal decorated CNT field emitter treated with post plasma the further reduction in the E_{to} and E_{th} fields was observed because it reduced the density of field emitters and improved the edge effect of metal nanoparticles CNT field emitters. Both methods are effectively improving the field emission properties of the CNT field emitters and it may be highly useful in the display device applications.