

Modeling Thermionic Emission from Carbon Nanotubes with Modified Richardson-Dushman Equation

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Abstract : We have modified Richardson-Dushman equation considering thermal expansion of lattice and change of chemical potential with temperature in material. The corresponding modified Richardson-Dushman (MRDE) equation fits quite well the experimental data of thermoelectronic current density (J) vs T from carbon nanotubes. It provides a unique technique for accurate determination of W_0 Fermi energy, E_{F0} at 0 K and linear thermal expansion coefficient of carbon nano-tube in good agreement with experiment. From the value of E_{F0} we obtain the charge carrier density in excellent agreement with experiment. We describe application of the equations for the evaluation of performance of concentrated solar thermionic energy converter (STEC) with emitter made of carbon nanotube for future applications.

Keywords : carbon nanotube, modified Richardson-Dushman equation, fermi energy at 0 K, charge carrier density

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