Electroluminescence from Electrolyte-Gated Carbon Nanotube Field-Effect Transistors

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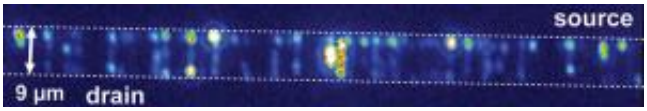

Emission spots: A composite image of electroluminescence from an array of carbon nanotubes during a gate voltage scan.

Field-effect transistors (FETs) based on single-walled carbon nanotubes (SWNTs) exhibit a range of optoelectronic effects including near-infrared electroluminescence.

The effect results from the injection of holes and electrons from opposite electrodes into the nanotube, where they recombine and emit light.

Advances in the understanding of the charge transport and the factors that affect electroluminescence efficiency in SWNTs are necessary to develop nanoscale light sources.

Researchers at Argonne's Center for Nanoscale Materials, working with scientists at the University of Illinois at Urbana-Champaign, have demonstrated electroluminescence by using highly aligned arrays of SWNTs. Using electrolytes instead of traditional oxide dielectrics facilitates injection and accumulation of high densities of holes and

electrons at very low gate voltages.

Numerous emission spots corresponding to individual nanotubes were observed.

Additional tunability of the optoelectronic properties is achieved by introducing thin layers of HfO_2 and TiO_2 to the gate dielectric.

More information: J. Zaumseil, X. Ho, J. R. Guest, G. P. Wiederrecht, J. A. Rogers, *ACS Nano*, DOI: 10.1021/nn9005736

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