Carbon Nanotube Fiber Based Broadband Photodetector

Ahmed Zubair[1] and Junichiro Kono[1,2]

[1]Department of Electrical and Computer Engineering, [2] Department of Physics and Astronomy, Rice University, Houston, Texas, U.S.A.

ahmed.zubair@rice.edu

Advanced materials utilizing carbon nanotubes (CNTs) have attracted the attention of researchers in diverse fields due to their extraordinary properties such as ultrahigh electrical and thermal conductivities, light weights, and high mechanical strengths. Films of aligned CNTs exhibit broad and strong optical absorption bands from the ultraviolet to the far-infrared wavelengths. This property of broadband absorption makes CNTs promising for solar cell and photodetector applications. CNT fibers, which have the unique properties of flexibility and high mechanical strength combined with the above-mentioned electrical and optical properties, hold the promise as flexible, broadband photodetectors with inherent polarization sensitivity. Here, we designed, fabricated, and characterized photodetectors based on CNT fiber. The detector operates based on the photothermoelectric effect (PTE), which is realized by forming doping gradients or junctions in the fiber. The photodetector showed responsivities up to 0.2 V/W at 660 nm along with strong polarization sensitivity in a broad spectral range.