

Carbon single-wall nanotubes (SWNTs) have been studied as the thermal-absorption coatings on large area pyroelectric detectors used for the precise measurement of laser power. The responsivity of these thermal detectors depends on the variation of reflectance of the detector coating as a function of wavelength. Gold-black coatings are capable of very low reflectance ranging from 0.2 % (UV wavelengths) to beyond 50 % (infrared wavelengths). However, such coatings are vulnerable to damage at moderate power density, physical contact (they can be literally blown away), as well as aging and hardening at UV wavelengths. SWNTs were recently explored as replacements for the gold-black coatings. Purified SWNTs were initially produced by a laser vaporization method and dispersed onto a pyroelectric detector surface using a simple airbrush technique. A coating that was slightly more reflective than the currently used gold black coating was obtained for wavelengths up to ~ 1500 nm. Above this wavelength, however, the responsivity of the SWNT coated detector decreased dramatically. This was attributed to the fact that metallic SWNTs have increased reflectivity at wavelengths greater than 900 nm¹. More recently, carbon multi-wall nanotubes (MWNTs) were grown on a pyroelectric detector coated with a nickel film catalyst using hot wire chemical vapor deposition. The responsivities were measured from 600 nm to 1800 nm and were normalized to the value of the gold black standard. The MWNT array was found to be more spectrally uniform, with variations of only a few percent at wavelengths > 1500 nm². Furthermore, the MWNT coatings were not only spectrally uniform but also had similar responsivity to gold black when they were tested in the infrared.