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Ultraviolet Laser Damage of Carbon Nanotube Coatings on Thermal Detector Platforms

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We have initiated a program to demonstrate the next generation of optical detector coatings using carbon nanotubes (CNTs). These coatings have been used on a variety of detector platforms for laser power and energy measurement standards. These coatings must be resistant to damage and aging while maintaining desirable optical and thermal properties over a range of laser wavelengths served by our calibration services (0.157 μm to 10.6 μm). To investigate the optical properties of these coatings we have employed a variety of techniques that rely on fundamental detector properties. In this paper, we report results from 248 nm excimer-laser damage investigations, documented using scanning electron microscope (SEM) images. We have studied multi-wall carbon nanotubes (MWNTs) grown by chemical vapor deposition on substrates made of either copper or lithium niobate. We also have investigated single-wall carbon nanotubes deposited on silicon carbide, quartz, and lithium tantalate. These damage studies have implications not only for enhancement and evaluation of thermal detector coatings, but for other CNT applications such as purification, and production of CNT-based field emitters.