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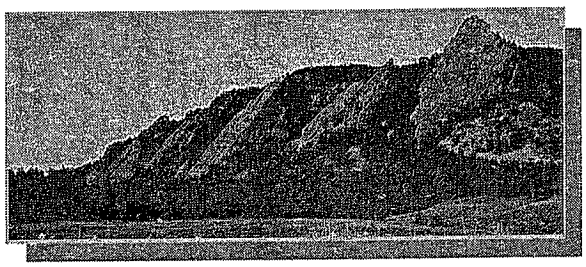

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Excimer laser purification of bulk carbon single-walled nanotubes and damage of carbon allotropes

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Katherine Gilbert completed her B.S. in Natural Science from the University of Puget Sound in 1996. She received a MS in chemical engineering from the Colorado School of Mines for her work on zeolite memberanes supported by NASA in 2000. She completed her Ph.D. thesis work in 2005 at the National Renewable Energy Laboratory investigating purification and gas adsorption properties of single-walled carbon nanotubes. Katherine is currently a postdoctoral researcher working in the Optoelectronic Division at NIST.

ABSTRACT TEXT:
Laser treatment of bulk carbon single-walled nanotubes (SWNTs) using an excimer laser is demonstrated as a potentially simple and fast purification method. Quantitative evidence for the selective removal of carbon impurities without destruction of nanotubes is shown by the decrease in the full width at half maximum of the Raman D-band for increasing fluence level, without changing the diameter distribution of the nanotube sample. Qualitative changes in the topology and morphology upon exposure are also shown by scanning electron microscopy. A 5 % change in responsivity of a pyroelectric detector coated with SWNTs is presented as a novel assessment of the change in SWNT coating topology.

In the context of damage mechanisms, the resonance of the incident photons and the pi-plasmon in the SWNT material is proposed as a theoretical basis for understanding the solid state properties of the SWNT versus the carbon allotropes. The interaction of both 248 nm and 193 nm incident photons with the SWNT material is considered. Additionally, exposure of the nanotube samples in air and in an inert atmosphere provides insight into the possible mechanism of purification.