Si(B)CN-Carbon nanotube Composite for High-Power Laser Radiometry

Romil Bhandavat
Kansas State University, Mechanical and Nuclear Engineering, Manhattan, KS, U.S.A.

Chris Cromer and John Lehman [S]
National Institute of Standards and Technology, Boulder, CO, U.S.A.

Gurpreet Singh [C]
Kansas State University, Mechanical and Nuclear Engineering, Manhattan, KS, U.S.A.
gurpreet@ksu.edu

Polymer-derived ceramic Si(B)CN-carbon nanotube composite was synthesized through controlled pyrolysis of a boron-modified liquid polymeric precursor on the surfaces of multiwall carbon nanotubes. Structural characterization was performed by use of various spectroscopic techniques. The presence of graphene like carbon, BN, SiC, Si_3N_4 phases in the ceramic shell was confirmed by Raman, Fourier transform infra-red, nuclear magnetic resonance and X-ray photoelectron spectroscopy. Thermogravimetric analysis revealed survival of carbon nanotubes up to at least 1000 °C in air. The composite powder was spray coated on copper test coupons and its optical absorption efficiency and laser damage resistance was observed to be > 90 % and >10 kW/cm^2 @ 10.6 μm exposure, respectively.