NanoIntegris

Technical Data Sheet

HiPco®

Single-Wall Carbon Nanotubes

NanoIntegris

Properties

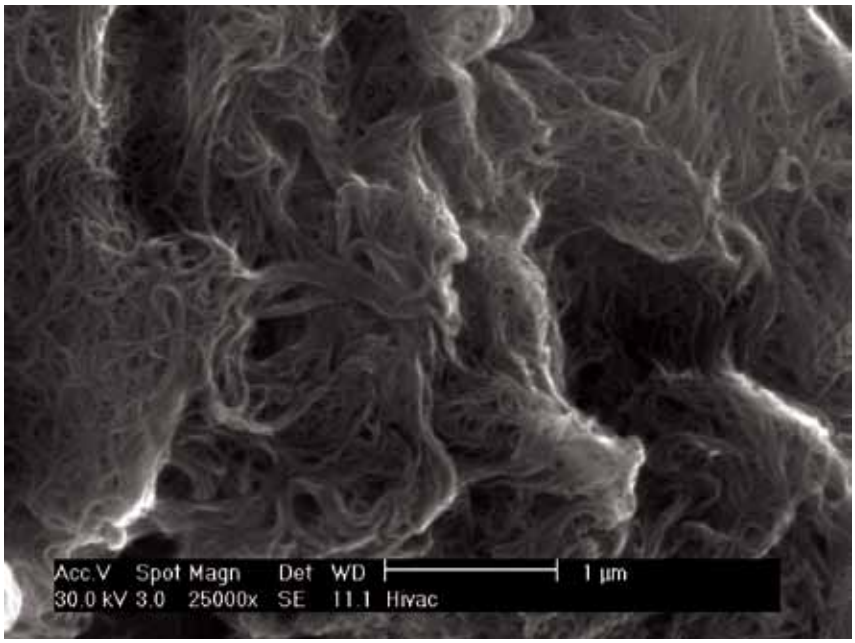
Individual SWNT Diameter[i]	~0.8 – 1.2 nm
Individual SWNT Length[ii]	~100 – 1000 nm
Calculated Molecular Weight[iii]	~3.4x10^5 – 5.2x10^6 Amu
Color	Black
Morphology	Dry powder of nanotubes bundled in ropes
Maximum Density[iv]	1.6 g/cm^3
Bulk Density[v]	~0.1 g/cm^3
TGA Residue as Fe[vi]	
- Raw	<35 wt%
- Pure	<15 wt%
- Super Pure	<5 wt%
TGA 1st Derivative Peak Temperature	Raw ~350 – 410°C Pure ~470 – 490°C Super Pure ~510 – 540°C
TGA Onset Temperature	Raw ~350°C Pure ~440°C Super Pure ~450°C
Maximum Surface Area[vii]	1315 m^2/g
BET Surface Area	~400 – 1000 m^2/g
Buckypaper Resistance[viii]	~0.2 – 2Ω
Moisture Content	<5 wt%

8025 Lamon Avenue, Suite 43, Skokie, IL 60077

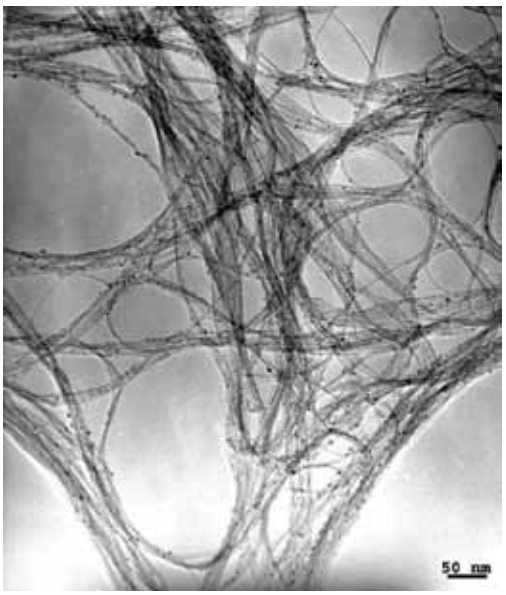
Tel USA: +1-216-314-0106 Fax: 1-847-556-0842 **eMail:** sales@nanointegris.com

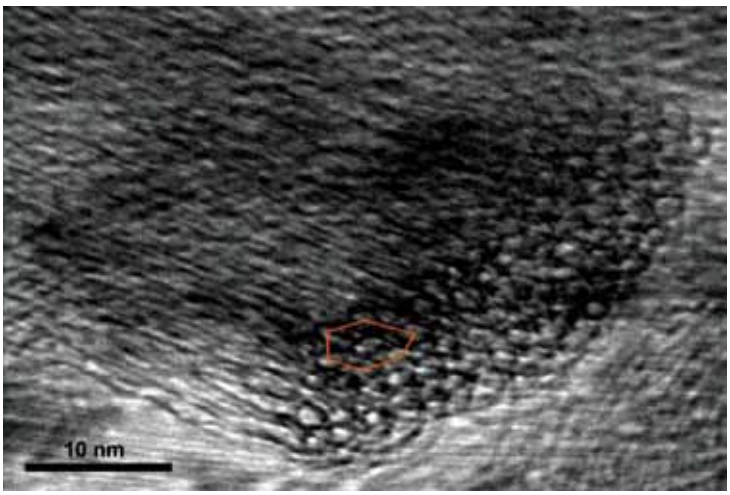
NanoIntegris

SEM



TEM



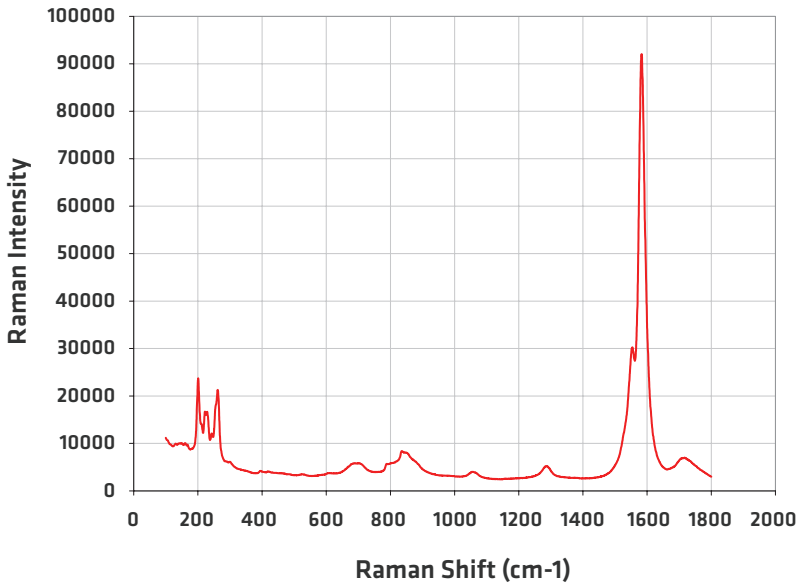


8025 Lamon Avenue, Suite 43, Skokie, IL 60077

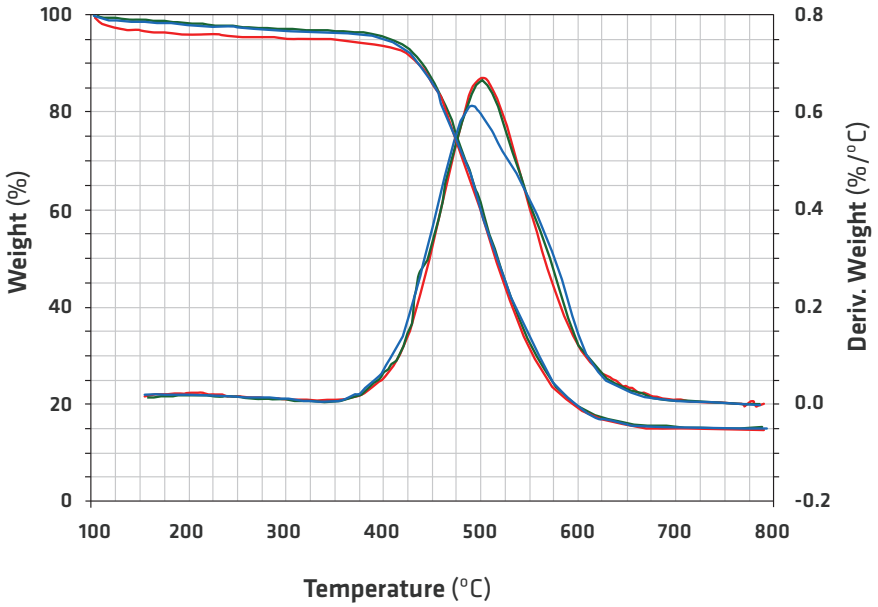
Tel USA: +1-216-314-0106 **Fax:** 1-847-556-0842 **eMail:** sales@nanointegris.com

NanoIntegris

Raman



TGA Profile

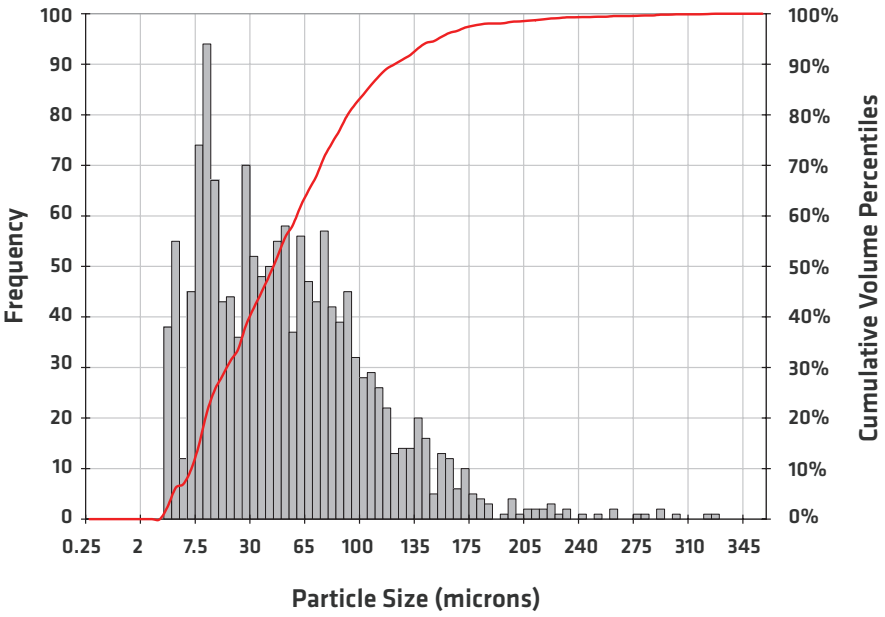


8025 Lamon Avenue, Suite 43, Skokie, IL 60077

Tel USA: +1-216-314-0106 Fax: 1-847-556-0842 **eMail:** sales@nanointegris.com

NanoIntegris

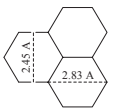
Particle Size Analysis



i Diameter distribution measured by Unidym from TEM micrographs. Mean diameter ~1.0 nm.

ii Measured by Unidym using AFM.

iii Calculated. Lower limit assumes a SWNT with a diameter of 0.8nm and a length of 100nm. (0.8nm/0.245nm)(3.1414)(2 carbon atoms) = 20 carbons around the circumference. For every 0.283nm length there are 4x20=80 carbon atoms. (100nm/0.283nm)(80)(12.01) = 339,505 Amu. Assuming 2 significant digits = $3.4x10^5$. Upper limit assumes a SWNT with a diameter of 1.2nm and a length of 1,000nm. (1.2nm/0.245nm)(3.1414)(2 carbon atoms) = 31 carbons around the circumference. For every 0.283nm length there are 4x31 = 124 carbon atoms. (1000nm/0.283nm)(124)(12.01) = 5,262,332 Amu. Assuming 2 significant digits = $5.2x10^6$.



iv Calculated assuming single-wall nanotubes of diameter 1.0 nm arranged in crystalline “ropes” or “bundles” (inter-wall spacing 0.3 nm).

v Value provided is for standard purified SWNTs. Raw and some super pure grades lots will have lower bulk densities. Other product forms may have higher bulk densities.

vi 800°C in air. The reported figures assume that the residue is present in the product as elemental Fe, and that it is fully converted to Fe_2O_3 during the TGA analysis. Hence, the TGA residual as measured is multiplied by MW Fe_2/MW Fe_2O_3 (1/1.43) to express the result as Fe.

vii Calculated using geometric arguments assuming an isolated tube. SSA for tubes in “ropes” will be less than the stated value. A. Peigney et al., Carbon 39 (2001), 507-514.

viii In-house, Unidym buckypaper conductivity test (4 point probe).

ix The following particle size histogram is indicative of the typical tertiary particle size distribution found in bulk powder. It does not represent secondary particles (aggregates of individual tubes also known as ropes or bundles) nor does it represent primary particle sizes (individual carbon nanotubes).

8025 Lamon Avenue, Suite 43, Skokie, IL 60077

Tel USA: +1-216-314-0106 Fax: 1-847-556-0842 **eMail:** sales@nanointegris.com