Technical Data Sheet

IsoSol-S100® Polymer-Wrapped Nanotubes

Ultra High-Purity Semiconducting SWNTs

Product Summary

The use of specialized patent-pending dialkyl homopolymers developed by the National Research Council of Canada within the Printable Electronics Consortium, has enabled us to disperse and extract single-walled carbon nanotubes to the highest levels of semiconducting enrichment and purity to date: IsoSol-S100. The starting materials are the purified and highly-scalable RF-plasma grown carbon nanotubes supplied by Raymor Nanotech[1].

UV-Vis-NIR spectrophotometric assessment of purity[2] indicate that this material has semiconducting purities at or greater than 99.9% with the metrics of Itkis Ratio[3] and Phi Values[4] exceeding 0.5 and 0.4, respectively.

The highly graphitized starting material and low sonication intensity utilized for the extraction technique minimizes damage to the nanotubes, allowing the material to exhibit high crystallinity and longer average lengths of 1µm, not previously seen when utilizing DGU[5] or Chromatography-based[6] separation methods.

Additionally, the material is processed in organic solvent and the polymer/nanotube ratio can be adjusted to less than a factor of four with nanotube concentrations 10x higher than our aqueous dispersions. The solutions also display stabilities of greater than six months. These properties promote great nanotube deposition and adhesion for device creation.

Experimentally, thin film transistors, prepared on SiO_2/Si substrates[7] have led to average mobilities exceeding 27cm^2/(Vs) and On/Off ratios of 1.8x10^6 and is perfectly-suited for commercial ink jet and aerosol jet printing.

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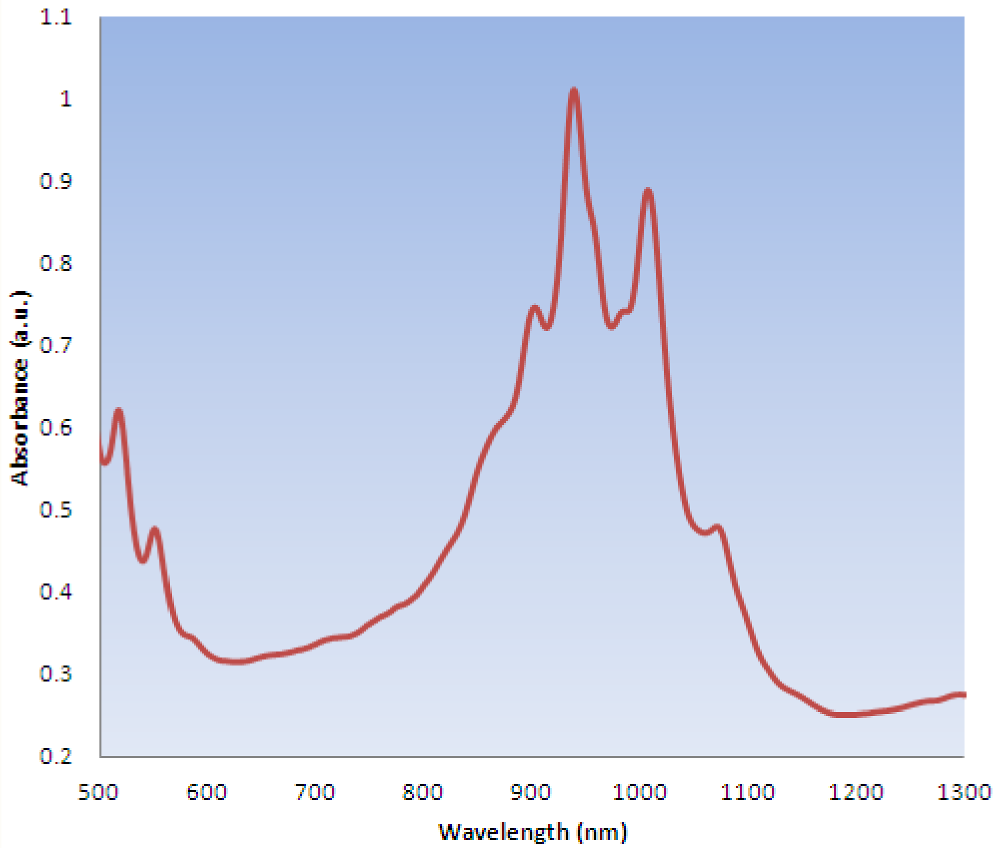
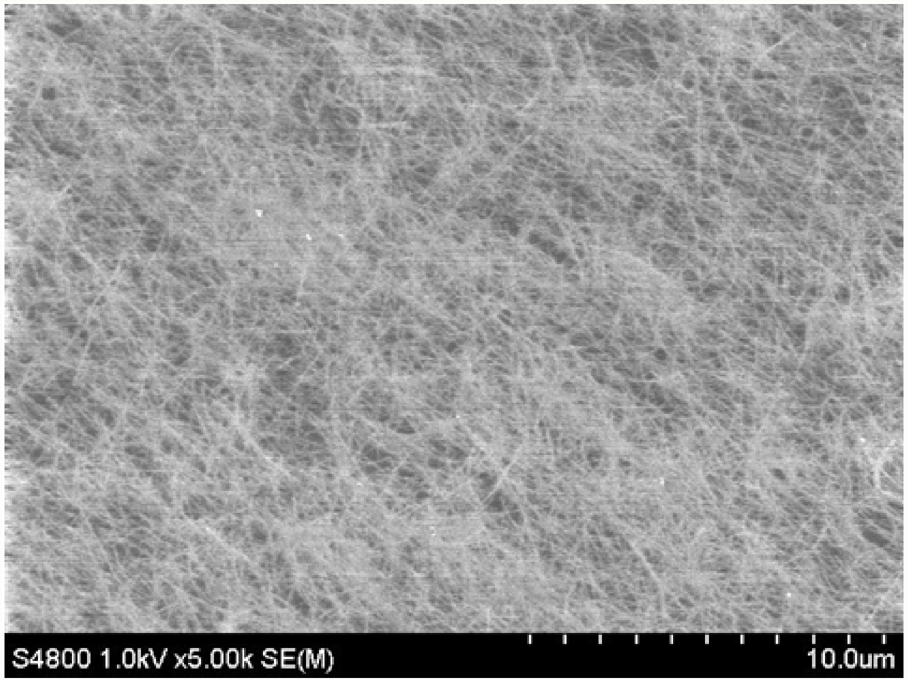
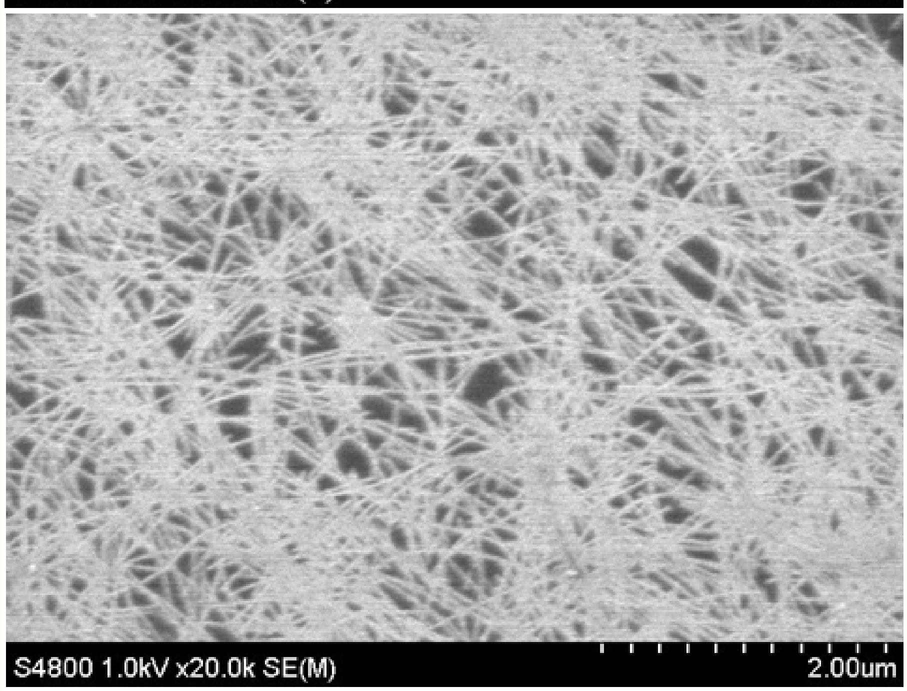
Product Specifications



Optical Purity	>99.9%
Itkis Ratio (Ï)	>0.5
Phi Value (Φ)	>0.39
Nanotube Concentration	>0.01mg/mL
Surfactant : Nanotube Concentration	<4
Standard Solvent Media	Toluene
Shelf Life	6-9 months

SEM and AFM





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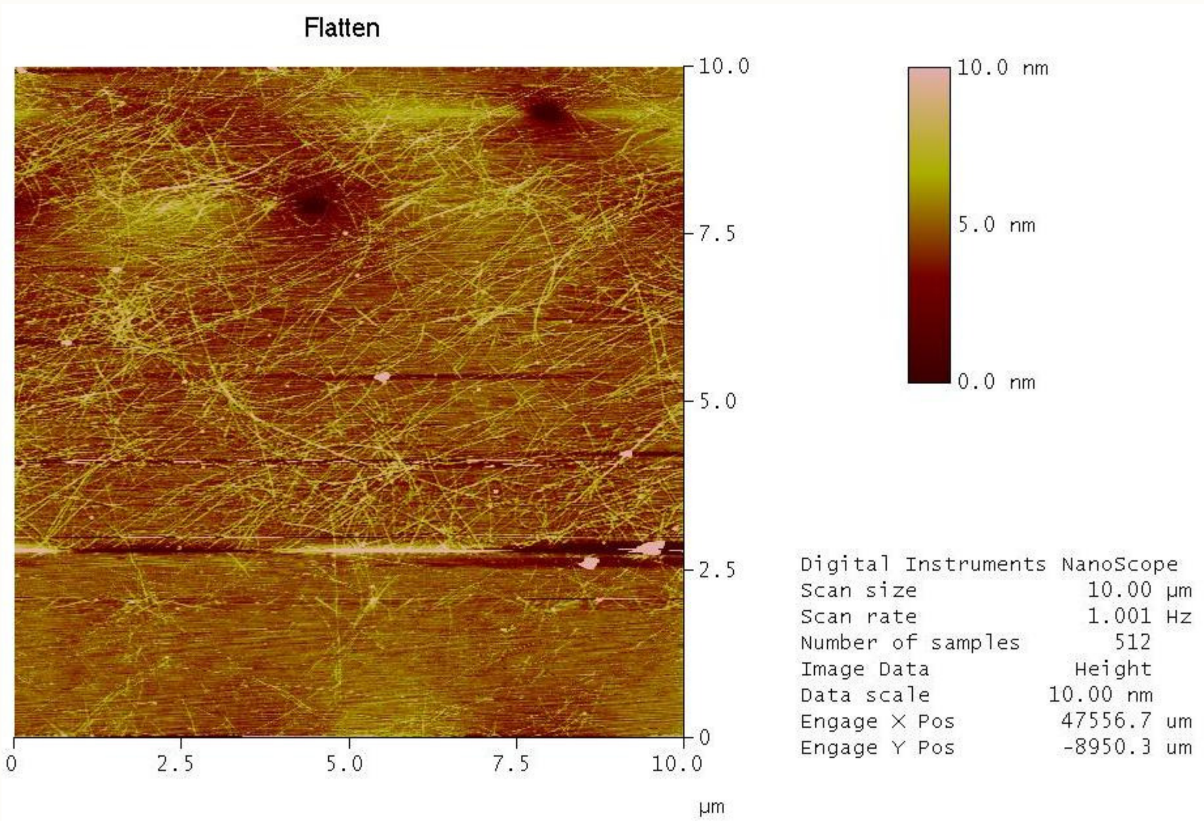
SEM and AFM



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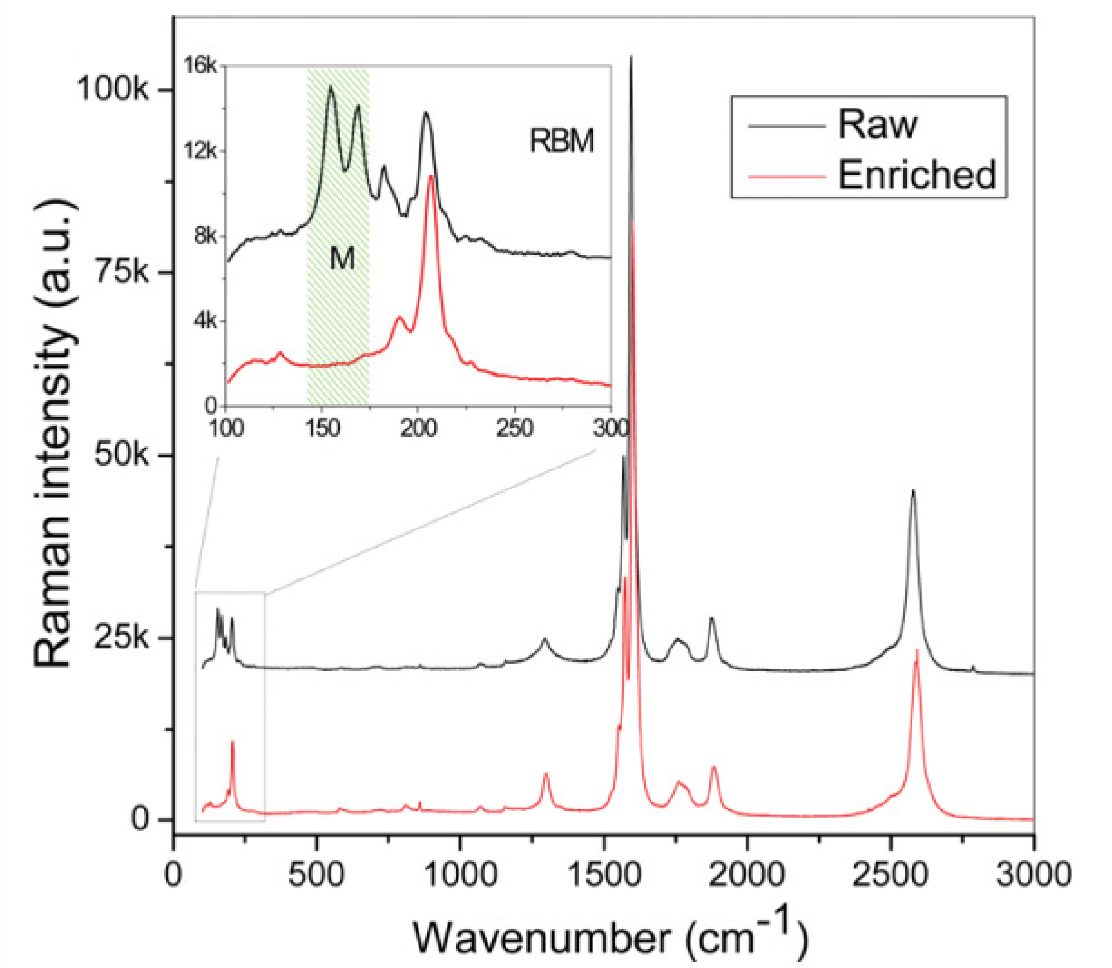
Diameter Range	1.2 - 1.4nm
Mean Length	1 µm

Raman



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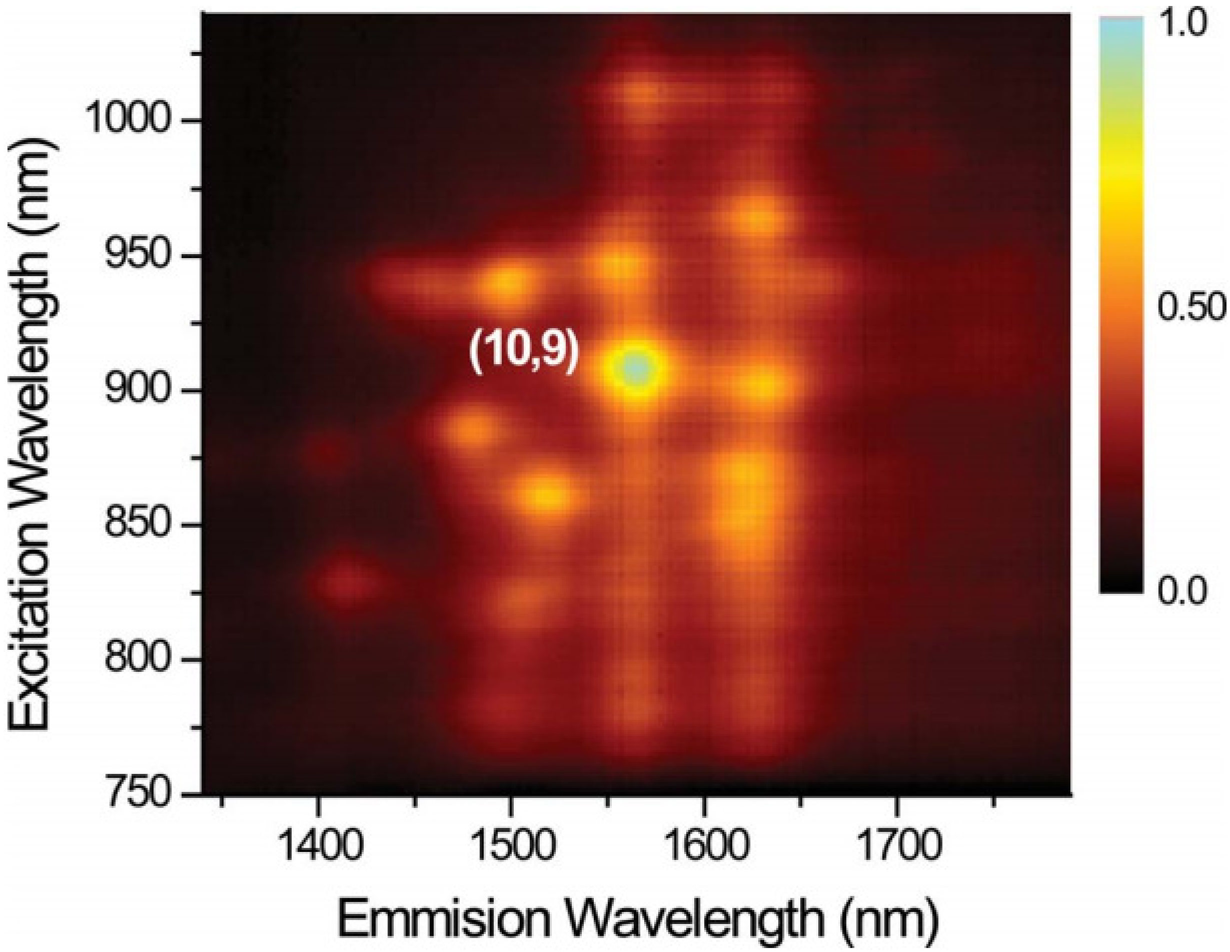
The Radical Breath Mode (RBM) of the spectra excited at 785nm shows that the IsoSol-S100 material has a nearly flat baseline in the metallic region from 145 to 175 cm^{-1}, indicative of a high semiconducting purity.

Metal Catalyst Impurity	<0.5 %
Amorphous Carbon Impurity	<1 %

PLE Map



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A photoluminescence excitation (PLE) map for the IsoSol-S100 material shows well resolved (S_{22},S_{11}) maxima, indicative of well separated nanotubes. UP to 19 (n,m) species contribute to the spectrum, with 8 or 9 having peak intensities higher than or close to 0.5. The (10,9) chirality peak with S_{11}=1570nm and S_{22}=910nm, proved to be the strongest.

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