Scanning Electron Microscopy Analysis of

Boron Nitride Nanotube Products from Different Suppliers

Summary

Seven Boron Nitride Nanotube products from five different suppliers were analysed for their morphology and purity using scanning electron microscopy. A summary of the products and analysis results are detailed below:

No.	Supplier	Product name	Product claim	Analysis result
1	BNNT Technology Ltd	Boron Nitride Nanotubes (BNNT)	Purity: 85% Diameter: 20-100nm Length: 10-100um	Purity: High Diameter: 30-120nm Length: >2um
2	US supplier	Boron Nitride Nanotubes	Purity: 89% Diameter: 2-10nm Length: <200um	Purity: Medium low Diameter: 10-70nm Length: 1-2um
3	US supplier	Boron Nitride Nanotubes	Purity: 99% Diameter: 2-10nm Length: <200um	Purity: Low Diameter: 10-50nm Length: >2um
4	Canadian supplier	Boron Nitride Nanotubes – Purified (BNNT-P)	Purity: 69% Diameter: ~5nm	Purity: Medium Diameter: 30-60nm Length: >2um
5	UK supplier	Multi-walled Boron Nitride Nanotubes	Purity: >70%	Purity: Medium high Diameter: 20-60nm Length: >2um
6	US supplier	Boron Nitride Nanobarbs (Powder Form)	Purity: >=90.0%	Purity: Low Diameter: 10-70nm Length: >1.5um
7	US supplier	Boron Nitride Nanotubes (Powder Form)	Purity: >=90.0%	Purity: Low Diameter: 10-50nm Length: 1-2um

The Boron Nitride Nanotube product from BNNT Technology Ltd has a significantly higher purity compare to all other products.

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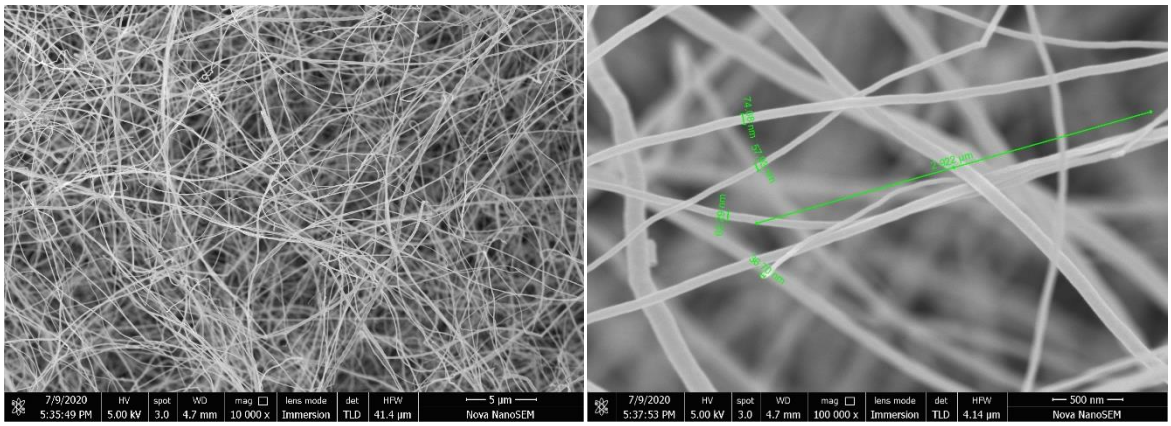
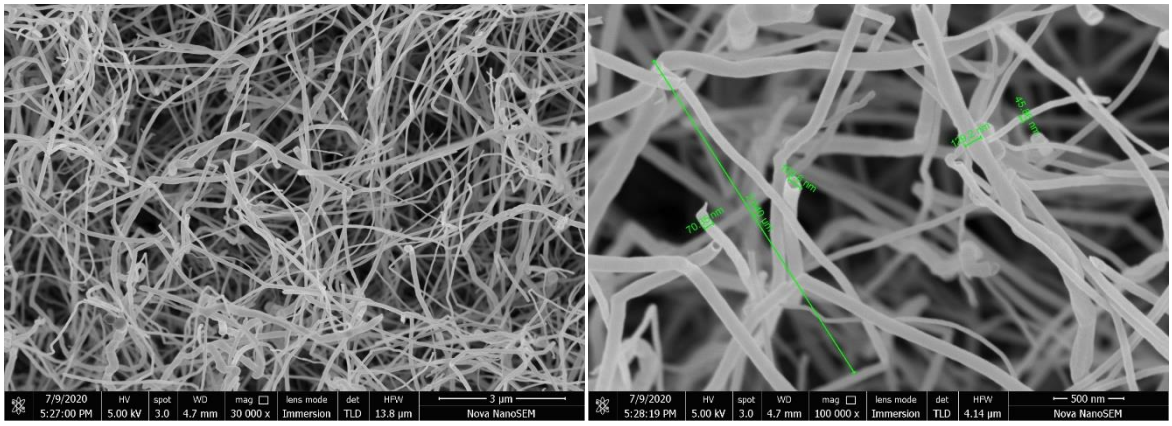
1. BNNT Technology Ltd (311ABN160100)

SEM image of Area 1, low magnification image (left) and corresponding higher magnification image with measurements (right).



SEM image of Area 2, low magnification image (left) and corresponding higher magnification image with measurements (right).



The diameter of the nanotubes (BNNT sample 4) is around 30 to 120nm, and the length is more than 2ums. It is clear that these nanotubes are hollow inside and it is even possible to see the thin wall of the nanotubes on the high magnification SEM images. A small amount of nanotubes that appear to have a diameter larger than 120nm, but most nanotubes are below 120nm in diameter. Regardless on the location of the measurements, the sample contains mostly nanotubes, and very little nanosheets and particles are observed. Therefore, the sample is high in purity. EDS analysis confirms that both boron and nitrogen peaks are present, so it is most likely boron nitride.