# Determine the Structure Information of Horizontal Carbon Nanotube Arrays by Optical Imaging

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Up to now, many methods have been used to characterize the structure of nanotubes in different aspects and scales. Transmission electron microscopy (TEM) and scanning tunnelling microscopy (STM) can provide atomic resolution images for nanotubes while the analytical area is quite limited (typically tens of nanometer). Scanning electron microscopy (SEM) and atomic force microscopy (AFM) are two most used methods to "count" the numbers of nanotubes, but they lack the ability of metallic/semiconducting (M/S) recognition and they even meet great challenges at lateral resolution as the density of nanotubes increases. Generally, conventional methods are hard to provide statistical structure information with high-throughput which is necessary for development of carbon nanotubes now.

Optical imaging and spectroscopy were widely used to monitor the structure of massive bulk materials. Here we utilize optical imaging to achieve high-throughput measurement on structure information of massive nanotubes on substrates. The high-throughput ability is realized by direct use of the multicolour information in optical image with contrast enhanced over 10 folds. We successfully employ this technique to characterize carbon nanotube arrays on their line density and M/S ratio in a statistical way for submillimeter view field with integration time less than one second.

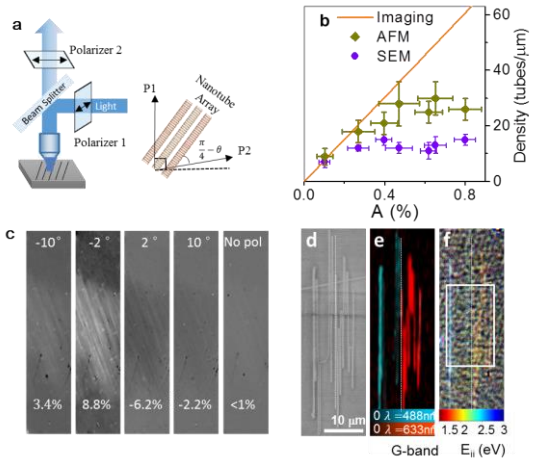


Figure 1 Optical multicolour imaging is used as a high-throughput statistical tool to determine the structure information of horizontally aligned carbon nanotube arrays on various substrates and in diverse environments.

## References

[1] S B Deng, J Y Tang, L X Kang, Y Hu, F R Yao, Q C Zhao, S C Zhang, K H Liu, J Zhang, High-throughput Determination of Statistical Structure Information for Horizontal Carbon Nanotube Arrays by Optical Imaging, ***Adv. Mater.*** **28,** 2018 (2016).