

13<sup>TH</sup> INTERNATIONAL CONFERENCE ON

## ADVANCED MATERIALS AND NANOTECHNOLOGY

OCTOBER 26-28, 2017 OSAKA, JAPAN

**Evaluation of carbon nanotube strength for application to composite materials****Keiichi Shirasu**

Tohoku University, Japan

For more than two decades, many researchers have focused on Carbon Nanotubes (CNTs) which have the superior electrical, thermal and mechanical properties, motivating their use in composites as a fibrous reinforcing agent. Although mechanical properties of CNT reinforced composites have been widely studied, only a few groups have reported strengthening effects for the composites. Before the utilization of CNTs becomes mainstream, it is necessary to develop protocols for tailoring the material properties, so that composites and devices can be engineered to given specifications. In this presentation, we review our recent studies, in which we investigate the nominal tensile strength and strength distribution of Multi-Walled CNTs (MWCNTs) synthesized by the CVD method, followed by a series of high-temperature annealing steps. The structural-mechanical relationships of such MWCNTs are investigated through tensile-loading experiments with individual MWCNTs, Weibull-Poisson statistics, Transmission Electron Microscope (TEM) observation and Raman spectroscopy analysis. The comparatively low value of the shape parameter for MWCNTs resulted from the irregular nanotube structure, which reflects a larger tube defect density relative to conventional fiber materials. Nonetheless, the MWCNTs with an intermediate level of crystallinity produced complete fracture of nanotube walls and exhibited higher nominal tensile strength, suggesting that improvements to the nominal tensile strength of MWCNTs might be achieved by inducing appropriate interactions between adjacent nanotube walls to enable sufficient load transfer to the MWCNT inner layers. This effect should be balanced to permit an adequate load transfer between the inner and outer walls to give clean break fractures.

**Biography**

Keiichi Shirasu has completed his BE, ME and PhD degrees from Tohoku University, Japan. During his PhD program, he has won the Research Fellowship (DC1) from the Japan Society for the Promotion of Science (JSPS). He is currently an Assistant Professor at Fracture and Reliability Research Institute, Tohoku University and has research interests centered on the mechanical, electrical and thermal properties of CNTs, CNT reinforced composites and their actuators.

keiichi.shirasu@rift.mech.tohoku.ac.jp

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