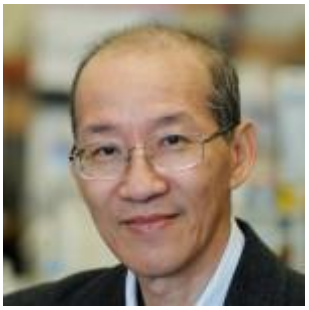
THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

INSTITUTE OF TEXTILES & CLOTHING
紡織及製衣學系

Textile Structural Composites: From 3D to 1D Fiber Architectures from strong to smart composites"



Prof. Frank KO
Advanced Fibrous Materials Laboratory
The University of British Columbia

Date: 31 March 2017
Time: 2:30 pm
Venue: ST602

Prof. Frank Ko is the Director of the Advanced Fibrous Materials Laboratory and Tier 1 Canada Research Chair Professor of Advanced Fibrous Materials in the Department of Materials Engineering at the University of British Columbia. A SAMPE Fellow and Fellow of Textile Institute (Hon), he is a recipient of the American Society for Composites award and the Fiber Society Award for Distinguished Achievement. Prof. Ko has co-authored four books and 33 book chapters. He has presented and published over 450 papers in the engineering design of fibrous structures for medical, industrial and composite applications. He is currently a Theme leader in the NSERC sponsored Lignoworks Network on Biomaterials. He is serving on the editorial board of several Journals. He was a member of the advisory committee on soldier protection for the US Army Board of Sciences of the National Research Council and a member of the advisory committee of the NRC in Canada.

Abstract
There is a global renewal of interest in manufacturing technology for lightweight materials, with a major focus on automotive composites. This is evident in the national initiatives embarked in recent years, notably the Institute for Advanced Composites Manufacturing Innovation (IACMI) led by the University of Tennessee in the USA; the Institute for Carbon Composites in Germany (LCC); and the National Composite Center led by Nagoya University in Japan. It is of interest to note that carbon fibers and textile structural composites (TSC) are the key focuses in these manufacturing initiatives. This presentation explains why and offers suggestions on future directions for TSC.

TSCs are composite materials reinforced by textile structures for primary structural applications. Although textile structures have long been used for composite reinforcement, serious use of textiles for structural composites did not occur until the entering of the space age with the development of carbon fibers and multiaxial 3D textile preforms. The need for affordable composites that have significantly improved through-the-thickness strength and damage tolerance intensified the development of a wide variety of textile preforms such as 3D braiding and multiaxial warpknit, which established the foundation for the use of textile composites for aircraft primary structures. Future growth and widespread usage of carbon fiber in automobiles depends on the availability of low cost carbon fibers and affordable composite manufacturing processes.

In this presentation, after a review of the unique strength/toughness characteristics of TSCs and their advanced applications, we will discuss the lessons learned in the development of TSCs with a focus on 3D fiber architectures. This will be followed by an introduction to the current approaches to reduce the cost of carbon fiber through the development of low cost renewable carbon fiber precursors. We will conclude by examination of future opportunities of smart Textile Composites for vehicle and human health monitoring as well as other functional applications (e.g energy storage, EMI shielding) using 1D multifunctional composite nanofibers.

~ALL ARE WELCOME~