NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

School of Materials Science and Engineering

Seminar Topic:
Carbon-Based Smart Windows for Thermal Conduction Modulation

Associate Professor Alfred Tok

Abstract

Heating, cooling and lighting account for huge energy usage (~1.04TW) in the US alone, representing up to 30% of a country's total energy usage. Whilst efforts have been placed to increase the use and efficiency of renewable energy sources like solar power, wind power etc, another energy consumption strategy is the reduction of energy usage thorugh smart technologies. In a building, a huge amount of energy is actually required for heating and/or cooling due to heat transfer through its windows. In many temperate countries, this energy requirement is for heating half the year, and cooling for the other half ot the year. This project focuses on the development of smart window technologies that can modulate (transmit or block) radiative or conductive heat transfer through a window, whilst still maintaining high optical transparency of the window. An electrochromic smart window technology has been developed to modulate radiative heat transfer through the window, and a carbon-based smart window technology has been developed to modulate conductive heat transfer through the window. These technologies both allow heat to be transmitted through the window (eg. solar heating in winter) or allow the window to be completely insulated (eg. at night in winter). This presentation focuses on the carbon based smart windows for modulation of conducted heat transfer, using various films like reduced graphene oxide, graphene quantum dots, and metal-doped carbon based films.

Biography

Associate Professor Alfred Tok has been a faculty member in the School of Materials Science and Engineering (MSE) since 2003. He studied Mechanical Engineering at the Queensland University of Technology, Australia, and graduated with First Class Honours in 1995. He was also conferred the Dean's Award for Excellence for being the top graduate. After graduation, he worked as a mechanical engineer at ST Aerospace Engineering. In 1997, he was awarded 2 scholarships at Nanyang Technological University to pursue his PhD in Mechanical Engineering. He obtained his MBA (Dean's List) in 2009 from the Nanyang Business School. In the same year, he was appointed Division Head of Materials Technology in MSE (till 2012). Since 2011, he has been the Deputy Director of the Institute for Sports Research in NTU.

His research areas focus on the processing and applications of inorganic materials in the areas of biosensors and renewable / sustainable energy. He also consults extensively for companies from various industries.

Wednesday, 4 November 2020 ǁ Time: 2:00 pm – 3:00 pm ǁ
Live Streaming Link (Blackboard Collaborate): https://ntu-sg.zoom.us/j/94784696864
Meeting ID: 947 8469 6864 Passcode: 4112020
Hosted by: Associate Professor Ali Miserez

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