

ITC Research Student Seminar 2017-18

Date : 6 October 2017 (Friday)
Time : 4:00 pm – 5:00 pm
Venue : Room ST602, 4D Theatre, The Hong Kong Polytechnic University

Speaker : Harishkumar Narayana (PhD Student)
Topic : Study of Stress Memory in Polymeric Materials and Its Application into Smart Compression Stockings

Speaker : ZHANG Yaokang (PhD Student)
Topic : Solution-processed Perovskite Solar Cells for Tandem and Flexible Applications

Abstracts

Topic: Study of Stress Memory in Polymeric Materials and Its Application into Smart Compression Stockings

Smart materials have gained a significant research interest from both industry and academia over past few decades due to their compelling novel behaviors. Research in material science related to healthcare applications are now getting intensified with an inception of smart materials such as stimuli responsive memory polymers. A novel phenomenon of stress memory in a semi-crystalline memory polyurethane has been recently discovered, in which the stress can be programmed, stored, and retrieved reversibly upon an external thermal stimulus. The potential of stress memory concept has been explored right from polymeric film, filaments/fibers, and fabrics to design and optimize the smart textile structure for advanced compression stockings. The multi-functional smart compression stocking unifies several functions which have been never done before such as pressure gradient, massage effect, selective pressure control, and single size stocking for all. The advent of the stress memory concept and scientifically implying them into compression stockings would take the compression treatment into one step advanced level to manage the phlebological and lymphatic disorders. The potential of memory polymeric film, fiber and fabric structures could be extended into multi-disciplinary areas such as pressure sensors, artificial muscles, and actuators where the stimuli responsive force is needed.

Topic: Solution-processed Perovskite Solar Cells for Tandem and Flexible Applications

Semi-transparent perovskite solar cells (st-PSCs) have received remarkable interest in recent years because their great potential in applications for solar window, tandem solar cells, and flexible photovoltaics. However, all reported st-PSCs require expensive transparent conducting oxides (TCOs) or metal-based thin films made by vacuum deposition, which is not cost effective for large scale fabrication: the cost of TCOs is estimated to occupy approximately 75% of the manufacturing cost of PSCs. To address this critical challenge, we report herein a low-temperature and vacuum-free strategy for the fabrication of highly efficient TCO-free st-PSCs. Our TCO-free st-PSC on glass exhibits 13.9% power conversion efficiency (PCE), and the four-terminal tandem cell made with our st-PSC top cell and c-Si bottom cell shows an overall PCE of 19.2%. Due to the low processing temperature, we also demonstrate the fabrication of flexible st-PSCs on polyethylene terephthalate (PET) and polyimide (PI), which show excellent stability under repeated bending or even crumpling.

~ All are welcome ~