

Co-organisers:

Supporting Organisation:



教育局
Education Bureau



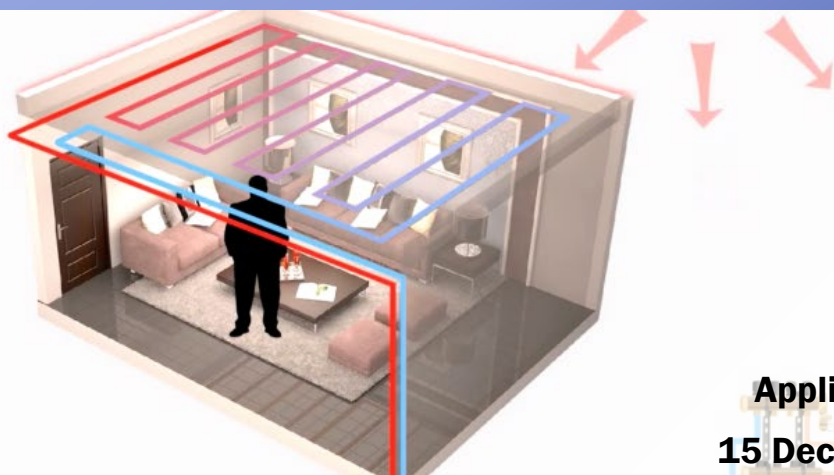
E2TEC014T
(Not-token required)



The Hong Kong Young Academy of Sciences (YASHK) talk series

Talk Series on Emerging Technologies – Science, Opportunities and Challenges 2023 Passive Radiative Cooling - Harnessing the Infinite Coldness of Our Universe to Cool Down the Earth

Professor LEI Dangyuan
City University of Hong Kong



Application Deadline
15 Dec 2023 12:00 noon

Intended Learning Outcomes

Upon completion of the programme, participants should be able to:

1. state the working principle of passive radiative cooling technology;
2. identify the roles of dielectric nanoparticles and hollow microspheres in achieving high solar reflectance and infrared thermal radiation;
3. explain the physical mechanism of employing fluorescent pigments to improve the solar reflectance and realize colored radiative cooling coatings.



◆ Introduction

Big cities are affected by the heat island effect, leading to hotter summers and the need for large buildings to use air conditioning for maintaining indoor temperatures within the human comfort range. However, air conditioners consume substantial amounts of electricity, resulting in significant carbon emissions. Additionally, the refrigerants used in cooling systems are potent greenhouse gases, further exacerbating global warming and creating a vicious cycle of increased energy consumption. Reducing the electricity required for building cooling has become a significant challenge in modern urban areas.

Passive radiative cooling technology offers a promising solution to this challenge, enabling cooling effects below ambient temperatures without electricity consumption or the need for traditional refrigerants. It is considered an effective approach towards achieving carbon reduction goals. A team led by Professor Dangyuan LEI, Professor of the Department of Materials Science and Engineering at the City University of Hong Kong and a member of the Hong Kong Young Academy of Sciences, has successfully developed a multifunctional coating that exhibits both sub-ambient cooling and self-cleaning functionalities as well as soft colors. This innovative coating, based on Professor Shanhui FAN's pioneering work on the passive radiative cooling technology at Stanford University in 2014, can reduce the surface temperature of buildings under direct sunshine, effectively maintaining indoor temperatures at around 26°C without relying on electricity. By exploiting the atmospheric infrared transparency windows, the coating can efficiently dissipate heat from the object's surface to the coldness of outer space, achieving temperatures lower than the ambient environment. The team has further enhanced the coating's design by incorporating physical principles of multiple scattering, fluorescence emission and broadband infrared radiation, reducing solar energy absorption while optimizing heat dissipation and exhibiting pastel colors.

In addition to its cooling capability, the coating also exhibits a self-cleaning capability. Similar to the surface of an umbrella, it repels water and leverages the lotus leaf effect, allowing rainwater to wash away dirt and debris, thereby improving building maintenance and durability. Moving forward, Professor LEI's team aims to develop a translucent coating that can be applied to the surfaces of buildings made from various materials, significantly reducing the energy required for building cooling while maintaining comfortable indoor temperatures.

◆ Schedule

Session	Date	Time	Venue
1	28 Dec	10:00 a.m. – 12:00 noon	Zoom Meeting

◆ Target Participants

- S1 – S6 HKAGE student members in 2023/24 school year.
 - Class size: 100
- * First-come, first-served.

◆ Medium of Instruction

Putonghua

◆ Certificate

E-Certificate will be awarded to participants who have attended the talk.

◆ Remark

Starting from the 2023/24 school year, after the first review period, ALL student members must complete the following requirements in each school year in order to maintain their membership:

- Attend One Talk; AND
- Participate in One programme or activity of any kind

◆ Enquiry



3940 0101



programme@hkage.org.hk



This talk is one of the items in the four domains of the Holistic Talk Series. The objective is to facilitate the all-round development of student' gifted potential.



The Hong Kong Young Academy of Sciences (YASHK) talk series

Talks are about emerging technology to inspire students' motivation in pursuing knowledge in specialized areas.



Celebrities Talk Series

Celebrities share their life-changing moments to enhance students' aspirations for life.



Academic Introductory Talk Series

Introduce trendy topics to widen the students' horizons.



Future Insight Talk Series

Professionals explain the latest trend in their industry to give students an insight to plan their future.

