

# Photomolecular Evaporation from Hydrogels and Pure Water

## Professor Gang Chen

Department of Mechanical Engineering  
Massachusetts Institute of Technology

**Date: Monday, January 22, 2024 15:00-16:00**

**Venue: Faculty of Engineering Bldg. 2, Room 31A**

### Abstract:

In recent years, experiments from different groups have reported that evaporation under sunlight from hydrogel and other porous materials can exceed the thermal evaporation limit by several times, i.e., super-thermal. We hypothesize that photons can directly cleave off water clusters at the liquid-vapor interface in a way similar to the photoelectric effect, which we call the photomolecular effect. We carried out over 20 different experiments on both hydrogel and water-air interface to demonstrate this effect. We also demonstrate that visible light heats up a thin layer of fog, with temperature rise peaking at the green wavelength, suggesting that this process can impact weather, climate, and the earth's water cycle. Our study suggests that the photomolecular effect should happen widely in nature, from clouds to fogs, ocean to soil surfaces, and plant transpiration, and can also lead to new applications in energy and clear water.

**Bio.** Gang Chen is the Carl Richard Soderberg Professor of Power Engineering at Massachusetts Institute of Technology (MIT). He served as the Department Head of the Department of Mechanical Engineering at MIT from 2013 to 2018. He obtained his PhD degree from the Mechanical Engineering Department at UC Berkeley. He was a faculty member at Duke University and UCLA, before joining MIT in 2001. He received an NSF Young Investigator Award, an R&D 100 award, an ASME Heat Transfer Memorial Award, an ASME Frank Kreith Award in Energy, a Nukiyama Memorial Award by the Japan Heat Transfer Society, a World Technology Network Award in Energy, an Eringen medal from the Society of Engineering Science, and the Capers and Marion McDonald Award for Excellences in Mentoring and Advising from MIT. He is a fellow of American Association for the Advancement of Science, the American Physical Society, The American Society of Mechanical Engineers, and the Guggenheim Foundation. He is an academican of Academy Sinica, a fellow of the American Academy of Arts and Sciences, member of the US National Academy of Engineering, and a member the US National Academy of Sciences.



Professor Gang Chen  
Department of  
Mechanical Engineering,  
Massachusetts Institute  
of Technology

主催： 東京大学大学院工学系研究科専攻間横断型教育プログラム 機械システム・イノベーション (GMSI)  
未来社会協創国際卓越大学院 (WINGS CFS)  
量子科学技術国際卓越大学院 (WINGS-QSTEP)  
統合物質・科学国際卓越大学院 (MERIT-WINGS)  
高齢社会総合研究国際卓越大学院 (WINGS-GLAFS)  
工学系WINGS産学協創教育推進基金  
本件連絡先： 東京大学大学院工学系研究科総合研究機構 教授 塩見 淳一郎  
GMSI事務局 E-mail: office@gmsi.t.u-tokyo.ac.jp Phone: 03-5841-0696