

講題: Thermal superinsulation and aerogel-based smart windows

摘要: Heating, ventilation, and air conditioning of buildings account for about 15% of the global energy consumption, but about 20% of this building-related energy is lost because of inefficient windows. Greenhouse emissions associated with producing and using this energy contribute substantially to climate change. Is there a solution to this challenging problem? Starting from the physical principles associated with energy loss through windows, I will describe our development of visibly transparent, infrared-reflecting, thermally super-insulating materials that may replace or retrofit the inefficient windowpanes of residential and commercial buildings. Using many demonstrations, I will discuss how production of such unusual transparent aerogels is aided by bacteria, with the source materials in the forms of waste of food industry and beer wort, to make such smart windows highly affordable. I will show how our aerogels can boost energy efficiency of windows and buildings in general, with a potential of helping solve challenging problems of growing energy demand and climate change.

講者簡介: Ivan I. Smalyukh is a full professor at the Department of Physics at CU-Boulder, which he joined in 2007 (promoted from Assistant to Associate Professor in 2014 and from Associate to Full Professor in 2017). He is also a founding fellow of Renewable Sustainable Energy Institute (a joint institute of CU-Boulder and NREL) and Materials Science Engineering Program. He directs the Soft Matter Physics Research Group at CU-Boulder with 34 research group members (PhD and undergraduate students, postdocs and visiting scholars). Prof. Smalyukh's research focuses on soft condensed matter, materials and biological systems, including liquid crystals, colloids, polymers, bacteria, gels, biomaterials and their photonic, electro-optic and energy-related applications. He published ~250 peer-refereed articles, including 8 in Nature and Science. He is an elected fellow of the American Physical Society. He received many awards, including the Bessel and Glenn Brown Awards, NASA iTech award and Mid-Career Award of International Liquid Crystal Society, the PECASE Award from the Office of Science and Technology of the White House and the GSoft Award from the American Physical Society.

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