

Co-sponsored with Department of Electrical Engineering

## Professor Yiguang Ju

Department of Mechanical and Aerospace Engineering  
Princeton University

### *Development of Nanophosphors for Biological, Security, and Energy Applications*



Rare-earth doped nanophosphors provide new opportunities for biological and energy applications such as photodynamic therapy, LEDs, and engine development because of their stable and efficient up and down conversion properties, increased light penetration depth, low toxicity, and reduced background scattering compared to conventional markers. At first, the seminar will give an overview of the progress of synthesis of rare-earth ion doped upconversion nanophosphors by using combustion and in-solution thermolysis methods. Secondly, the particle morphology and its photophysical property are discussed. The dynamic dependence of particle luminescence time on particle size and phonon energy is analyzed. Thirdly, the efficacy of photodynamic therapy for singlet oxygen production and cancer cell killing by using upconversion nanophosphors will be presented. Finally, the application of nanophosphors in advanced engine development and opportunities using low temperature flames and plasma assisted low temperature combustion for the synthesis of functional nanomaterials will be discussed.

Yiguang Ju is a Robert Porter Patterson Professor at Princeton University. He received his bachelor degree in Engineering Thermophysics from Tsinghua University in 1986, and his PhD degree in Mechanical and Aerospace Engineering from Tohoku University in 1994. He was appointed as an Assistant and Associate Professor at Tohoku University in 1995 and 1998, a Changjiang Professor and the Director of Thermophysics Institute at Tsinghua University in 2000, and a Professor at Tokyo Institute of Technology in 2014. Prof. Ju's research includes combustion, propulsion, and functional nanomaterials with special interests in the areas of near limit combustion, microscale combustion, plasma assisted propulsion, alternative fuels, chemical kinetics, multiscale modeling, and nano-phosphors.

Host:  
Prof. Yongfeng Lu  
Department of  
Electrical Engineering

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Friday, February 20, 4:00 pm  
136 Jorgensen Hall