

Nanoscale Optics and Laser-based 2D and 3D Nanomanufacturing

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ABSTRACT

This presentation describes studies of optical phenomena at the nanoscale with the aim of coupling light into high intensity, nanometer scale spots. In particular, we study aperture-type optical antennas with specially designed geometry. These antennas are designed to strongly resonate with the incoming radiation, and the radiation intensity from the antenna is further increased using various strategies to enhance antenna resonances, or arranging an array of such structures that are strongly coupled through both electric and magnetic fields. It will be demonstrated that these special nanoscale optical structures can be used for a wide range of engineering applications, including high precision laser-based nanomanufacturing nanoscale processing, improving efficiency of solar energy harvesting, and in the ultra-high density, next generation data storage technique called Heat Assisted Magnetic Recording. The emphasis will be given on various strategies for laser-based nanomanufacturing to create 2D and 3D structures with high speed.

Biography: Xianfan Xu is James J. and Carol L. Shuttleworth Professor of Mechanical Engineering at Purdue University, USA, with a courtesy appointment in Electrical and Computer Engineering. He obtained his B.Eng. degree in Engineering Thermophysics from the University of Science and Technology of China (1989), and M.S. (1991) and Ph.D. (1994) degrees in Mechanical Engineering from the University of California, Berkeley. His current research is focused on ultrafast and nanoscale optics and their applications. He is the recipient of the National Science Foundation Faculty CAREER Award and the Office of Naval Research Young Investigator Award, and is the recipient of GM Faculty Fellowship, B.F.S. Schaefer Young Faculty Award, Discovery in Mechanical Engineering Award, and the American Society of Mechanical Engineers Heat Transfer Memorial Award. He was elected Fellow of the American Society of Mechanical Engineers in 2006, Fellow of SPIE in 2009, and Fellow of OSA in 2017. He currently serves as an Associated Editor for Scientific Reports and Optics Express.