Integration of metasurfaces onto Micro Electro Mechanical Systems for active control of visible and IR light

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LECTURE ABSTRACT

The design and implementation of metasurface-based flat lenses have come to the forefront of ongoing scientific research and technology development. These novel photonic devices use sub-wavelength metal or dielectric resonators spaced on a specific two-dimensional pattern that mimic the phase profile of conventional bulk optical elements. However, most of these structures, or metasurfaces, have so far been passive with its optical performance determined only by the spatial configuration of the metasurface constitutive elements. The development of dynamic metasurfaces is currently a growing area of research directed to obtain real-time tunable operation of metasurfaces and new physical phenomena not feasible with static metasurfaces. Faster reconfigurable metasurfaces can be achieved by incorporating nanostructures with different optical response onto MEMS based actuators. The MEMS-metasurface platform enables electrostatic control of curvature, tilt angle and deformation of metasurfaces, enabling flat and agile optical elements with micro-second reconfiguration time. These unique dynamic metasurfaces may provide new opportunities for information optics and imaging by performing complex signal processing directly in the optical domain.
In this presentation, I will describe the fundamentals and advantages of incorporating metallic and dielectric metasurfaces onto MEMS devices and the challenges associated with their patterning and integration.

SPEAKER BIOSKETCH

Daniel López is the Group Leader of the Nanofabrication and Devices group at the Center for Nanoscale Materials at Argonne National Laboratory and a Fellow of the Institute for Molecular Engineering at the University of Chicago. Dr. López received his Ph.D. in Physics from the Instituto Balseiro in Argentina in 1996. After obtaining his Ph.D. he worked as a Postdoctoral Fellow at IBM T. J. Watson Research Center doing research in the field of vortex physics in high-temperature superconductors. In 1998 he joined Bell Laboratories (Murray Hill, NJ) as a full-time Research Staff member where he developed micro and nano-machines for basic scientific research, optical communications, and imaging. In 2000 he received the Bell Labs President's Gold Award, the highest recognition award at Bell Laboratories for developing disruptive technologies with direct impact on the business. His research career spanned many areas, but common themes have been micro and nano machines, quantum fluctuation-induced forces, photonics and novel materials. He has authored more than 140 technical publications, holds 28 granted and pending patents and has given invited talks all over the world. He collaborates with the industrial sector and with researchers and educators worldwide.