IQSE AMO QO Seminar Series

Tuesday, September 5th 2023, 12:30 pm ZOOM & IQSE seminar room (MPHY 578)

Pizza will be served for IQSE members at 12:00 am. The talk will start around 12:30 pm

Dr. J. Gary Eden

(University of Illinois)

Low temperature deposition of oxide films driven by VUV/deep-UV radiation or arrays of microplasmas, and photolithography at 172 nm

ABOUT THE SPEAKER: J. Gary Eden has served as a member of the faculty of the University of Illinois (Urbana) for 43 years. After receiving the Ph.D. degree in Electrical Engineering in 1976, he conducted research in the Optical Sciences Division of the U.S. Naval Research Laboratory (Washington, DC) from 1976 to 1979. While at NRL, he co-discovered several lasers, including the KrCl (222 nm) laser and the first proton beam-pumped lasers (Ar-N2, XeF). Since joining the faculty of the University of Illinois in 1979, he and his students have pursued the discovery of lasers and high-power lamps and their applications, atomic, molecular and ultrafast laser spectroscopy, optical physics in atoms and small molecules, and the science, technology, and commercialization of microcavity plasma devices. He is currently the Intel Alumni Endowed Chair Emeritus in the Department of Electrical and Computer Engineering (ECE) at UIUC, and is a co-Founder of Eden Park Illumination, EP Purification, Cygnus Photonics, EPL Power Electronics, and the Eden Park Foundation. Sixty-three individuals have received the Ph.D. degree under his direction, and his current research focuses on laser fusion energy (LFE), ultrafast optical physics such as the control of atomic coherences, a new generation of optical amplifiers, VUV photochemistry in the solid state, plasma photonic crystals, and the disinfection of drinking water in the developing world. He was elected to the National Academy of Engineering in 2014.

EVENT DETAILS: Thin film deposition processes such as atomic layer deposition (ALD) and chemical vapor deposition (CVD) are generally regulated by the temperature of a substrate. That is, the decomposition of the molecular reactants (precursors) proceeds at thermal equilibrium, and the gas phase and surface chemistry rates are governed by the Arrhenius equation. In an effort to lessen the dependence of electronic and photonic device film growth on temperature, processes developed at the University of Illinois are designed to drive the gas phase/substrate interface chemistry far from equilibrium. Silicon dioxide (SiO2) films deposited at room temperature with a rate of ~50 nm/minute by the photodissociation of tetraethyl-orthosilicate (TEOS) at 172 nm in the vacuum-ultraviolet (VUV) spectral region have electrical and optical characteristics comparable, or superior to, those of films deposited at considerably higher substrate temperatures. The dielectric breakdown strength for 40 nm-thick SiO2 films, for example, is 5 MV-cm-1 which rises to 7.5 MV-cm-1 if the films are post-annealed at 200 °C. The latter value is within 12% of the measured value for 40 nm films deposited at 1000 °C by thermal oxidation (i.e., the "gold standard"). Similar results for Ga2O3 (deposited by microplasma-assisted ALD), and the performance of 172 nm photolithography, will also be described.

ZOOM information:

https://tamu.zoom.us/j/98156251523?pwd=QVdSdGxtL1UyY0g1L083SU5QR0QrUT09

Meeting ID: 981 5625 1523
Passcode: 297578

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+13462487799,,98156251523# US (Houston)
+16694449171,,98156251523# US