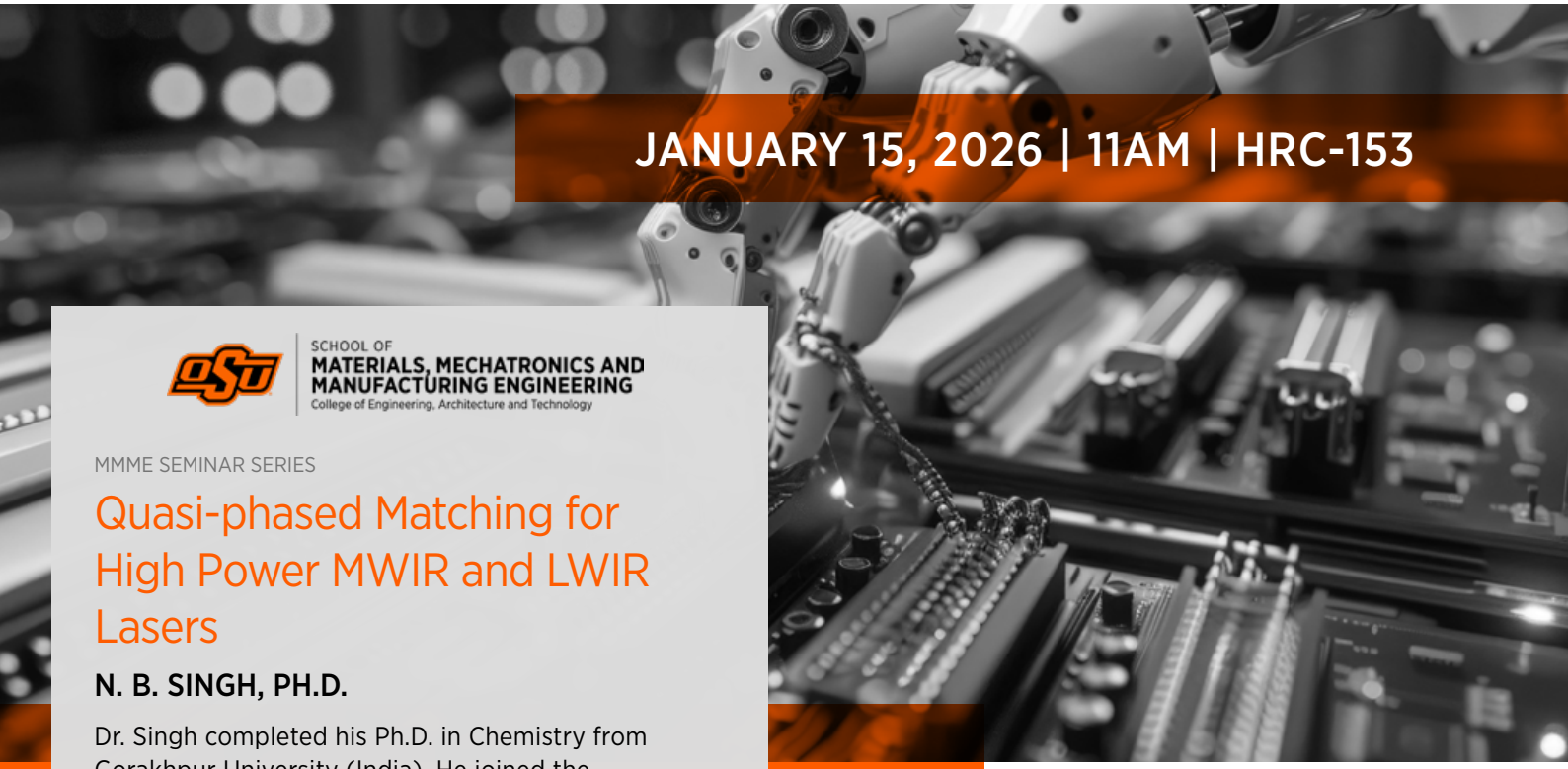


JANUARY 15, 2026 | 11AM | HRC-153

SCHOOL OF
MATERIALS, MECHATRONICS AND MANUFACTURING ENGINEERING
College of Engineering, Architecture and Technology

MMME SEMINAR SERIES

Quasi-phased Matching for High Power MWIR and LWIR Lasers

N. B. SINGH, PH.D.

Dr. Singh completed his Ph.D. in Chemistry from Gorakhpur University (India). He joined the Westinghouse Electric Corporation (now Northrop Grumman) in as a Senior Engineer and was promoted to Fellow, Advisory Engineer, and given increasing responsibilities until his retirement where he was Technical Director. Subsequently, he joined the UMBC in 2012. He is recognized for his professional career though awards of Fellow memberships of ASM International, SPIE, OSA, and RSC. He is granted 25 patents, published extensively as evident from 230 journal papers, 90 plenaries, keynotes and invited lectures at national and international conferences, 125 conference papers, and 250 corporate trade secrets. He has transitioned several defense technologies which are saving lives of USA and friendly forces including Crystal based Passive Missile Warning Systems (PMAWS) for which he was awarded highest corporate award and Industry Week R&D Star Award. In addition, he received Engineering Materials Achievement Award of ASM for the Development of Material for Hyperspectral Imager, Stookey International Award of the American Ceramic Society Glass & Optical Materials Division and the Deutsche Glastechnische Gesellschaft (GOMD-DGG) for Innovation and Discovery. Dr. Singh served as an Executive Committee member of the American Association for Crystal Growth for 12 years, and the founder of the Northrop Grumman Materials Corporate Forum which focuses on critical materials for defense. He also served as a panel member of the National Academy of Sciences on the National Materials Advisory Board (NMAB) for many years.



ABSTRACT

There is a continuous effort to produce high power laser in Mid Wavelength Infrared (MWIR) and Long Wavelength Infrared (LWIR) regions using second and higher harmonic generation (SHG) and optical parametric oscillation (OPO) methods. To achieve this goal, efficient nonlinear optical materials with large transparency and low absorption coefficient are required which can be used for the direct conversion from commercially available 1.06 μm pump lasers. We have been working to replace rareearth doping by transition-metal in hydroxyapatites and selenide hosts to produce high intensity emissions in MWIR and LWIR. With increasing thrust of space applications and miniaturization, we have developed a quasi-phase matched (QPM) concept for producing high power lasers on wafers. Since ZnSe is closely lattice-matched to GaAs, we developed physical vapor transport (PVT) method to deposit ZnSe on GaAs orientation-patterned templates. The patterns were designed to achieve alternating [0 0 1] and [-0 0 1] orientations. The quality of the films was evaluated by X-ray diffraction, scanning electron microscopy (SEM), and anisotropic etching to determine the morphology and crystallinity. We have grown and characterized zinc selenide (ZnSe) films up to millimeter thickness on (GaAs) wafers and demonstrated the wavelength conversion in MWIR and LWIR regions.

PIZZA LUNCH PROVIDED

ZOOM MEETING