College of Engineering and Computer Science

Spring 2020 - Distinguished Speaker Series

"High-performance, heteroepitaxial, device layers on single-crystal-like, artificial substrates and controlled self-assembly of nanostructures within device layers for wide-ranging electrical & electronic applications"

Friday - January 24, 2020
11:00 a.m. - 12:00 p.m. - HEC 101

Abstract: For many energy and electronic applications, single-crystal-like materials offer the best performance. However, in almost all cases, fabrication of single-crystal form of the relevant material is too expensive. In addition, for many applications, very long or wide materials are required, a regime not accessible by conventional single-crystal growth. This necessitates the use of artificially fabricated, large-area, single-crystal-like substrates suitable for heteroepitaxial growth of the relevant advanced material for the electronic or energy application in question. In this talk, details of the fabrication of such substrates will be provided. Heteroepitaxial growth of nanolaminate multilayers and devices on such substrates using a variety of deposition techniques such as pulsed laser ablation, sputtering, e-beam evaporation, MBE, MOCVD, and chemical solution deposition will be reported upon. Application areas that have been demonstrated via the use of such artificial substrates include - oxide high-temperature superconductors, semiconductor materials (Si, Ge, GaAs, CdTe, Cu_2O), ferroelectrics ($BaTiO_3$), multiferroics ($BiFeO_3$), etc. These heteroeptaxial layers have or can be realized via roll-to-roll deposition for scaling-up. In addition, strain-driven self-assembly of second phase nanomaterials at nanoscale spacings has been demonstrated within device layers. Control of heteroepitaxy in lattice-mismatched systems and the effects of strain on self-assembly will be discussed. Such heteroepitaxial device layers on large-area, single-crystal-like artificial substrates are quite promising for a range of electrical and electronic applications.

Dr. Amit Goyal, SUNY-Buffalo

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Bio: Dr. Amit Goyal is the ***Director of RENEW***, SUNY-Buffalo's new interdisciplinary institute dedicated to research and education on globally pressing problems in energy, environment and water. One of the most expansive initiatives launched by the university in recent years, RENEW (Research and Education in eNergy, Environment and Water) will harness the expertise of more than 100 faculty members across six schools and colleges and add more than 20 new faculty members. Dr. Goyal has developed clean energy technologies for over two decades. He has authored more than 350 technical publications and has 87 issued patents comprising 70 US and 17 International patents, and over 20 patents pending. He was the most cited author worldwide in the field of high-temperature superconductivity from 1999-2009. He has received numerous accolades including the presidential level ***DOE's E. O. Lawrence Award*** in the inaugural category of ***Energy Science & Innovation***. The US Department of Energy (DOE) Secretary on behalf of the President of the United States bestows the award. He is a member of the ***National Academy of Engineering (NAE)***. He has been elected Fellow of nine professional societies: the *National Academy of Inventors (NAI)*, the American Association for Advancement of Science (AAAS), the Materials Research Society (MRS), the American Physical Society (APS), the World Innovation Foundation (WIF), the American Society of Metals (ASM), the Institute of Physics (IOP), the American Ceramic Society (ACERS) and the World Technology Network (WTN). He concurrently holds the title of ***SUNY Empire Innovation Professor at UB***. He is also ***Emeritus Corporate Fellow and Distinguished Scientist*** at Oak Ridge National Laboratory. In addition, he is the ***Founder, President & CEO*** of TapeSolar Inc., a private-equity funded company and also the ***Founder, President & CEO*** of TexMat LLC, an IP holding and consulting company.