

Thursday, August 26th, 2021
4:00 PM – 5:00 PM, Virtual

<https://asu.zoom.us/j/86960690591>

Natural Properties and Applications of Ultra Wide Bandgap Semiconductors

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Abstract:

A new class of semiconducting materials with bandgap greater than 4 eV are now considered crucial for future high voltage, high power electronics that would enable the future electricity grid. Surprisingly, these ultra-wide bandgap semiconductors, more commonly recognized as gemstones or ceramics, include diamond, aluminum nitride, boron nitride and aluminum oxide. These ultra-semiconductors can support electric fields greater than any currently used semiconductors. Moreover, under an applied electric field, free electrons respond with higher velocity indicating a low electrical resistivity. These strongly bonded materials also have high sound velocities and consequently high thermal conductivity to conduct heat away.

Ultra Materials for a Resilient Smart Electricity Grid or ULTRA (<https://ultracenter.asu.edu/>) is a new Energy Frontier Research Center funded by the Department of Energy and hosted by ASU. ULTRA brings together 17 research teams from eight institutions extending from Bristol UK to Stanford California. The center includes four thrusts on materials synthesis, interfaces, electrical response and thermal properties, and it is inter connected to a broader group of researchers and technical leaders through a Future Grid Co-Design Ecosystem. This unique organization is designed to enable progress by solving the most relevant basic science questions.

This talk will introduce the ULTRA materials, identify some of their unusual properties, and describe the synergistic approaches to address the scientific challenges. The talk will also highlight some wide-ranging applications of ULTRA materials.

Biography:

Robert J. Nemanich is Regents' Professor, in the Department of Physics, Arizona State University. He completed BS and MS degrees in physics at Northern Illinois University, and Ph.D. in physics at the University of Chicago. Prior to ASU he was at Xerox Palo Alto Research Center (PARC), and North Carolina State University. Nemanich has a long-standing involvement with the Materials Research Society and has served as MRS President and President of the International Union of Materials Research Societies (IUMRS). He is a Fellow of the American Physical Society and has served as Chair of the executive committee of the Division of Materials Physics. His research is now focused on ultra-wide bandgap materials or Ultra Materials.

Host: Prof. Fernando Ponce

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