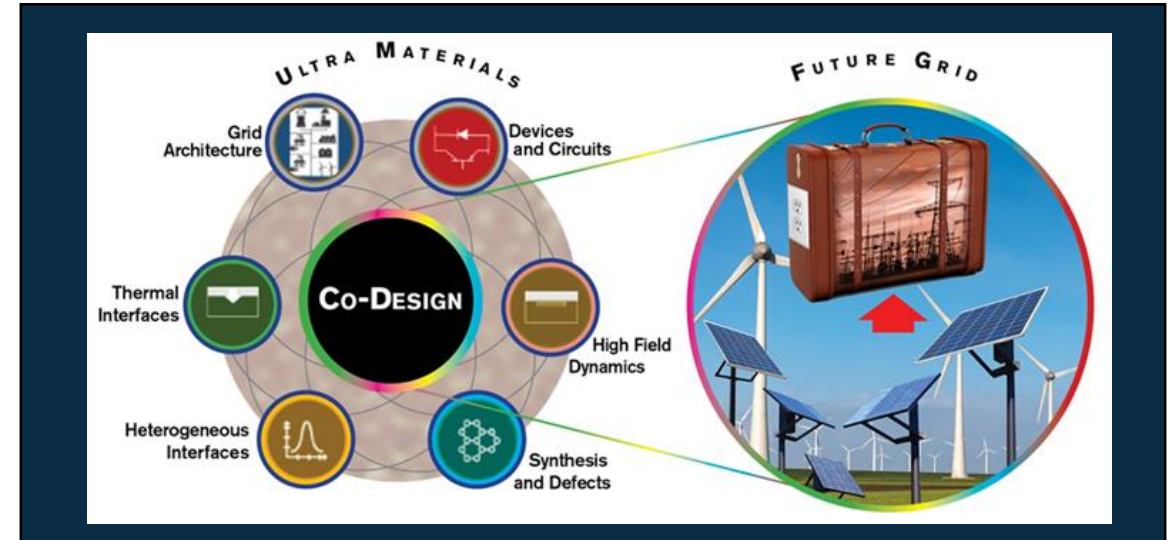


Ultra Materials for a Resilient, Smart Electricity Grid (ULTRA)

Director: Robert J. Nemanich (Arizona State University); Class: 2020 – 2026

MISSION: to understand fundamental phenomena in ultra wide bandgap (UWBG) materials – including synthesis, defect and impurity incorporation, electronic structure at interfaces, the interaction of electrons and phonons at high fields to achieve extreme electrical properties, and phonon phenomena that affect thermal transport. The Future Grid Co-Design Ecosystem enables communication across all levels of the science and technology.



RESEARCH PLAN: Specific outcomes include: 1) scalable synthesis of cubic and hexagonal UWBG semiconductors and effective doping using their unique properties, 2) synthesized UWBG heterostructures with designed interface electronic properties, 3) demonstration of high electric-field breakdown and high current transport in UWBG semiconductors, 4) optimized electron-phonon interactions for efficient thermal transport in UWBG materials and importantly, their interfaces, and 5) predictive assessment of UWBG materials in power electronics and the electric grid network.

<https://ultracenter.asu.edu/>

