PURDUE
ENGINEERING

NUCLEAR ENGINEERING

Nuclear Engineering Seminar

Jordan Evans, Ph.D.

Texas A&M University

Wednesday, February 14, 2018

3:30pm | PHYS 112

Jordan Evans graduated from Texas A&M University with a B.S. in Nuclear Engineering, M.S. in Nuclear Engineering, and Ph.D. in Materials Science and Engineering. Jordan's immediate research is focused on discovering and developing novel manufacturing techniques and applications of advanced nuclear materials. He has worked on projects such as the additive manufacturing and radiation response of nuclear materials, the fabrication of advanced nuclear fuels, the coating of Zircaloy cladding with a variety of protective thin films, the development of monoclonal antibody-conjugated radioactive nanoparticles for the treatment of cancers and aggressive disseminated diseases, and nuclear-assisted catalysis, among others. As a graduate student, Jordan won the Texas A&M University-wide research competition among all students, earning him the distinction of "The Texas A&M University 12th Man of Research". Jordan was also one of 16 members to visit Washington D.C. as part of the 2016 United States Nuclear Engineering Student Delegation, in which he discussed nuclear energy, medicine, and policy issues with our elected representatives, the DOE, the NRC, and others.

Anisotropic Response of Laser Additively Manufactured Nuclear Alloys to Radiation Damage

Additive manufacturing has emerged as a viable fabrication method to create high performance components with complex geometries in a potentially time- and cost-effective manner. However, limited experimental results have been reported on the response of additively manufactured nuclear alloys exposed to high doses of radiation damage. The primary topic of this presentation will cover the radiation response of Inconel 600 and 316L stainless steel rods built using laser additive manufacturing (LAM). Conventionally manufactured controls were purchased from a commercial vendor and concurrently characterized for comparison. All rods were similarly heat treated with no cold working. The samples were irradiated using neutrons (low dose) and self-ions (high dose), and characterized to investigate the LAM build orientation dependence of the mechanical and microstructural changes induced by radiation damage. In general, as-annealed LAM rods had anisotropic microstructural and mechanical properties. Additionally, LAM rods showed a variety of anisotropic changes due to radiation damage, including hardening and segregation. Build direction-dependent empirical relationships were generated which approximately fit the radiation-induced hardening and segregation data. Phenomenologically meaningful relationships were also derived based on dislocation interaction theory which closely fit the measured hardening and segregation data. Other topics will also be discussed briefly, including the fabrication of the accident-tolerant nuclear fuel candidate UN/U3Si2, and the development of nano-enhanced targeted radionuclide therapy for the treatment of cancer.