Indirect Selective Laser Sintering of Nuclear Cermets

Patrick L. Snarr

Advisors: Joseph Beaman, PhD., Derek Haas, PhD.

The University of Texas at Austin

patricksnarr@utexas.edu

Abstract:

Additive manufacturing (AM) is being adopted by many industries due to its ability to decrease low volume run lead times and provide greater design freedom for engineers. The nuclear industry is now investigating AM to discover how it can impact the future of nuclear proliferation and energy. One area AM has the potential to innovate in the nuclear industry is the additive manufacturing of cermets (ceramic/metal composite). Cermets aim to combine ceramics capabilities to operate in harsh environments with the structural integrity of metals. The objective of this research is to develop an indirect selective laser sintering process capable of printing nuclear cermets. This will require all steps of the process to be performed in an inert atmosphere. The material system of choice will be Zirconia/Zirconium cermet. Fabricated specimens will be tested to characterize the impact ceramic volume fraction has on mechanical properties. Metrology specimens will also be printed to determine geometrical capabilities of the process as well as determine the tolerances that can be expected. This research aims to bring nuclear cermet fabrication via additive manufacturing to a readiness level where applications of such structures can begin to be explored.