ABSTRACT
Critical engineering applications such as turbine engines and fission reactors among others require materials to operate in some of the known harshest environments. As a result, Ni-base superalloys and refractory metals are some of the most difficult to process and costly materials to manufacture in desired geometries through conventional manufacturing making them high risk and high reward. Additive manufacturing (AM) by offering flexibility of design and ease of manufacturing has opened significant opportunities for innovation. However, similar to conventional manufacturing, these materials are notorious for their non-weldability and defect formation during AM processing. As a result, an interdisciplinary approach to understanding the processability of the materials and innovative approaches for inspection of the materials is required for certification and qualification of the final geometries to allow for introduction into service. This talk will discuss this interdisciplinary approach with a case study on gas turbine engines as well as the development of refractory materials for next generation energy applications.

BIOGRAPHY
Dr. Michael Kirka is a Senior Research Staff and the Group Leader of the Deposition Science and Technology Group at Oak Ridge National Laboratory. Michael’s current research focuses on evaluating the suitability and limitations of high temperature materials for use in extreme environments for processing via additive manufacturing routes. Through developing an interdisciplinary team encompassing backgrounds of metallurgy, data science, modeling, and simulation, the processing science necessary to enable materials of ever-increasing operational capabilities (High gamma prime Ni-base superalloys and refractory metals) while overcoming many non-weldability materials challenges has been achieved. Michael received his B.S. in materials science 2007 from The University of Michigan and M.S. and Ph.D. degrees from The Georgia Institute of Technology in mechanical engineering in 2010 and 2014 respectively.