The DOE Advanced Fuels Campaign

Jon Carmack
Idaho National Laboratory, P.O. Box 1625, Idaho Falls, Idaho 83415-2528
jon.carmack@inl.gov

The mission of the Advanced Fuels Campaign (AFC) is to perform Research, Development, and Demonstration (RD&D) activities for advanced fuel forms (including cladding) to enhance the performance and safety of the nation's current and future reactors; enhance proliferation resistance of nuclear fuel; effectively utilize nuclear energy resources; and address the longer-term waste management challenges. This includes development of a state-of-the art Research and Development (R&D) infrastructure to support the use of a "goal-oriented science-based approach." AFC uses a "goal-oriented, science-based approach" aimed at a fundamental understanding of fuel and cladding fabrication methods and performance under irradiation, enabling the pursuit of multiple fuel forms for future fuel cycle options. This approach includes fundamental experiments, theory, and advanced modeling and simulation.

The AFC is responsible for evaluating new concepts for accident tolerant LWR fuel and cladding technologies. Any new fuel concept proposed for enhanced accident tolerance under rare events must comply with current operational, and safety constraints, as well as fuel cycle impacts and current LWR design constraints. There are currently a number of ATF concepts and potential technologies that are being investigated by industry, academia, DOE national laboratories and the international community. The goal of the U.S. DOE accident tolerant fuel program is to insert a lead fuel assembly or lead fuel rod into an operating commercial nuclear reactor by 2022.

Current Department of Energy fuel and material research programs are tasked with research and development of new fuel and material technologies but are also tasked with developing techniques and resources to improve the basic understanding of material response to irradiation environments. This paper will provide an overview of the Advanced Fuel Campaign activities including the near term activities in advanced nuclear fuel system research and development as well as highlighting general activities pursued to improve the study, modeling, and simulation of irradiated nuclear materials.