

Development of Nuclear Power Plant Safety Technologies: Accident Tolerant Fuels, Passive Cooling and FLEX Engineered System

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Abstract:

Since the accident at Fukushima, one major goal of reactor safety research has been the development of more accident tolerant technologies, coupled with other thermal hydraulic methods that can mitigate or delay fuel degradation during a Beyond Design Basis Accident. One major effort has been focused on development of claddings and coatings for light water reactor fuel cladding. FeCrAl cladding, Chromium-coated Zircaloy clad are of the leading options. In this work, the MELCOR systems code (version 1.8.6 UDGC) is used to evaluate the performance of FeCrAl cladding and Cr-coated Zircaloy clad as compared to Zircaloy clad for a Pressurized Water Reactor, PWR (i.e., Surry) for a Station Blackout (SBO) accident scenario. Passive cooling and FLEX engineered system, such as core recovery cooling injection and auxiliary feedwater injection, are also considered during the ATF performance analysis for extra copying time. Our future work is focused on the uncertainty analysis of the oxidation rate data, coating failure criteria, and severe accident modeling limitations in order to better quantify ATF (Accident Tolerant Fuels) clad benefits.

Bio:

Dr. Jun Wang is assistant scientist of Nuclear Engineering and Engineering Physics at the University of Wisconsin-Madison. He is working on several research projects funded by Department of Energy about nuclear power plant safety technologies, especially the accident tolerant fuels. Meanwhile, he is very activities in academy community. He is invited to be associate editor of the Journal of *Frontiers in Energy Research, Nuclear Energy*. He is editor on board of *open engineering*, and *experimental and computational multiphase flow*. Meanwhile, he is also the book editor of *Elsevier Nuclear Energy Book Program*. He has been awarded as outstanding reviewer by the journals of *International Journal of Heat and Mass, Transfer, Experimental Thermal and Fluid Science, Applied Thermal Engineering, Nuclear Engineering and Design, Progress in Nuclear Energy, Annals of Nuclear Energy*, and so on. He is also helping in organizing nuclear engineering conferences. He served as session chair of *International Congress on Advances in Nuclear Power Plants 2018*; Session Co-Chair of *ANS Winter Meeting 2018*; and Session Co-Chair of *International Conference of Nuclear Engineering 2017*.