NE 795-010 Advanced Reactor Materials and Materials Performance

Exam 4

The associated point values provide an indication of the expected thoroughness of response.

1. What is unique about the reactor conditions inside research reactors, including geometry, compared to LWRs? (8 pts)
2. Why is amorphization of concern in research reactors? (8 pts)
3. What are benefits and drawbacks of USi fuel compared to UAl fuel? Why is there a push towards UMo fuel? (10 pts)
4. Describe the differences in U3Si and U3Si2 swelling. (6 pts)
5. The gamma phase of UMo is not the thermodynamically stable phase at research reactor temperatures. Why is this phase the dominant phase in-reactor? (6 pts)
6. What effect does the solidus/liquidus gap have on fabrication of UMo fuels? (6 pts)
7. Discuss the evolution of fission gas bubbles in UMo fuel as a function of burnup. (12 pts)
8. What is the role of the Zr layer in UMo monolithic fuels? What are the consequences of adding this layer? (8 pts)
9. Why is Al ideally suited for the research reactor environment when it is unable to be used in LWRs? (8 pts)
10. What are some considerations when optimizing the composition for F/M steels? (8 pts)
11. Why do ferritic steels swell considerably less than austenitic steels? (10 pts)
12. What role do the oxide particles play in ODS steels? What properties do ODS steels specifically display that improve upon F/M steels? (10 pts)