Exam 4: NE533: Nuclear Fuel Performance

1. A ZIRLO cladding tube is in reactor at 625 K for 400 days. The initial wall thickness is 500 μm.
2. Estimate the oxide thickness after this time? (8 pts)
3. Assuming the hydrogen pickup fraction is 18%, what is the weight PPM of hydrogen in the cladding after one year? Assume PBR = 1.56, ρZr = 6.5 g/cc, ρZrO2 = 5.68 g/cc. (8 pts)
4. Determine the total change in the fuel volume given: αth=11x10-6, fission rate = 3.5x1013 fiss/cm3-s, T=1200 K, Tref=300 K, Δρ0=0.01, BD=5 MWD/kgU, ρ(UO2)=10.97 g/cc, t=85 days. (16 pts)
5. Why does metallic fuel undergo constituent redistribution? (5 pts)
6. What are some of the key differences in MOX fuel compared to LWR fuel? Emphasize differences on in-reactor behavior/performance/environment. (8 pts)
7. What are the performance/behavior differences between a RIA and a LOCA? Provide an example of a RIA. (8 pts)
8. Provide two examples of limiting phenomena governing LWR operation. (4 pts)

Water chemistry question

TRISO fuel performance question

Second MOX question

Conceptual corrosion question

1. Hydrides question: option: Where can hydrides form within cladding? What causes hydride concentrations to be heterogeneous? (6 pts)