AHMED ALKAABI

DEVELOPMENT OF A THREE-DIMENSIONAL FULL CORE TRANSIENT THERMAL HYDRAULICS MODEL OF THE US GEOLOGICAL SURVEY TRIGA REACTOR

Safety analysis plays a very important role in insuring nuclear reactor safety under normal operations or in the event of unexpected accidents. Reactivity Initiated Accidents (RIA) are extensively studied in order to evaluate the safety of nuclear reactors during rapid insertions of reactivity. Heat transfer and fluid in these conditions can be very complicated and simplified, one-dimensional, models may not accurately represent these scenarios. However, detailed three-dimensional thermal-hydraulic models are very computationally demanding. TRIGA reactors, such as the Geological Survey TRIGA Reactor (GSTR) offer an excellent basis for the development of fast-transient thermal hydraulic models, as they can be safely pulsed with large instantaneous reactivity insertions. This research will develop a full core transient thermal-hydraulic model of the GSTR that couples a core kinetics model with a detailed thermal hydraulics model in order to accurately predict the behavior of the GSTR during fast and slow reactivity transients.

SATIRA LABIB

SAFETY ANALYSIS OF SEVERAL STAGE TO ORBIT NUCLEAR THERMAL ROCKET ENGINES

Manned spaceflight beyond the Earth's moon economically is reliant on decreasing earth-to-orbit launch costs. The development of a launch vehicle with increased specific impulse compared to modern day chemical rockets could potentially achieve lower launch costs and shorten transit times. Recent advances in the development of high power density fuel materials make nuclear thermal rockets (NTRs) a viable technology for future space exploration. This thesis considers the safety concerns related to launching a nuclear thermal rocket from the Earth's surface. The project developed a set of nuclear thermal rocket cores to examine the effect of scaling on rocket performance and safety. The initial series of NTR cores range from 0.50 to 2.0 GW of power with a specific impulse of 850 s.

MICHAEL SERVIS

UNDERSTANDING THIRD PHASE FORMATION: A STUDY OF TBP AND DAAP

Tri-butyl phosphate (TBP) is used commercially as the extractant in the PUREX process for the extraction of uranium and plutonium from spent nuclear fuel. However, TBP is prone to forming a third phase under high concentrations of extracted metal ions and nitric acid. A structurally similar alternative extractant, di-amyl amyl phosphonate (DAAP), shows an increased resistance to third phase formation relative to TBP. The goal of this research is to understand the significant differences in aggregation chemistry and third phase formation between TBP and DAAP that result from minor structural changes. This understanding can be used to guide the design process of entirely new extractant molecules.