Contribution ID: **242** Type: **ORAL**

Performance Analysis of Various Thorium Fuel Options for the Sodium Cooled Fast Reactor

Thursday, June 29, 2017 8:20 AM (20 minutes)

Thorium is an attractive fuel option due to its inherent characteristics compared with U-Pu fuels. Less production of the long-lived transuranics with thorium fuel increases the proliferation-resistance and also reduces the high level radioactive waste in concern. Purpose of this study is to test and evaluate fuel performance and TRU transmutation performance of various design options with thorium fuel loaded in the core of sodium cooled fast reactor.
Evaluation was done for the modified core design concept of the Prototype Gen-IV Sodium-cooled Fast Reactor (PGSFR) which is a R&D reference model developed by Korea Atomic Energy Research Institute in Korea. Calculation was done with code package, TRANSX/DANTSTS/REBUS-3. Analyses was conducted on three fuel type categories (1) Oxide fuel; UO2, (Th,U)O2, (U,Pu)O2, (Th,Pu)O2, (U,TRU)O2, (Th,TRU)O2, (2) Metal fuel; U-Zr, Th-U-Zr, U-TRU-Zr, Th-TRU-Zr, and (3) Nitride fuel; (U,TRU)N. For reasonable comparison, all geometry and structure material, except smear density, had same size and same composition. Thorium and Uranium fuels were compared in each fuel type. Because of the low conversion ratio, more than 20% enrichment was required in case of UO2 core. Therefore the fuel cycle length was decreased from 290 days to 190 days. Only UO2 fuel and (Th,U)O2 cycle length was changed.
Results showed that TRU fraction charged in Th-TRU-Zr fuel was higher than U-TRU-Zr fuel resulting in higher TRU consumption rate. As more TRU was charged in the core, BOC excess reactivity was increased. This influenced safety parameters for the Unprotected Transient Over Power accident. Neutron spectrum in all cores using oxide fuel was softened compared with metal fuels. In comparison of (Th,TRU)O2 and (U,TRU)O2, thorium oxide makes sodium void worth less positive and TRU consumption rate much larger than uranium oxide.

Country/Int. Organization

Rep. of Korea

Primary author: Prof. KIM, Myung Hyun (Kyung Hee University)

Co-authors: Ms CHOI, Jinha (Kyung Hee University); Mr PARK, YoungHo (Kyung Hee University)

Presenter: Prof. KIM, Myung Hyun (Kyung Hee University)

Session Classification: 7.4 Fuel Cycle Analysis

Track Classification: Track 7. Fast Reactors and Fuel Cycles: Economics, Deployment and Proliferation Issues