Contribution ID: **124** Type: **ORAL**

Uranium and mixed uranium-plutonium nitrides thermal stability

Thursday, April 21, 2022 12:04 PM (12 minutes)

The thermogravimetric method was used to study the behavior of uranium nitride and mixed uranium-plutonium nitride (MNIT) in a helium flow and a helium with nitrogen gas mixture at temperatures up to 2173 K. When heated in helium in the low-temperature range (˂1773 K), a mass loss was found, which amounts to hundredths of a percent. In this case, mass loss occurs in 2 stages, accompanied by the release of nitrogen and it is not associated with the decomposition of uranium or plutonium mononitrides. It has been shown that sintered nitride fuel pellets may contain several percent of uranium sesquinitride U2N3, which decomposes in this range. Nitride fuel pellets were heated in a gas mixture of helium with nitrogen to study the formation of higher nitrides. In the case of uranium mononitride this led to the formation of uranium sesquinitride U2N3 in the temperature range of 673-723 K. However, upon further heating (>1173 K), U2N3 decomposes again to uranium mononitride in 2 stages. The sequential formation and decomposition of uranium sesquinitride led to the destruction of the sample. At the same time multiple heating of the MNIT fuel (U0.79Pu0.21)N in the helium-nitrogen gas mixture does not lead to the formation of U2N3. It is also shown that the partial pressure of nitrogen at its content of 5 vol.% in the helium flow significantly exceeds the equilibrium partial pressure of nitrogen over the samples of uranium nitride and MNIT fuel in the entire test temperature range, which inhibits the decomposition of uranium mononitride up to 2173 K. However, in the case of MNIT fuel at a temperature >1773 K a clearly observed mass loss on the thermogravimetric curve occurs. Therefore, even in an atmosphere containing nitrogen, it was not possible to suppress the decomposition process of the MNIT fuel.

Country/Int. organization

Russian Federation

Authors: KRIVOV, Mikhail (Joint Stock Company "A.A. Bochvar High-technology Research Institute of Inorganic Materials"); Mr TENISHEV, Andrey (National Research Nuclear University MEPhI (Moscow Engineering Physics Institute)); Mr KIREEV, Gennadiy (Joint Stock Company "A.A. Bochvar High-technology Research Institute of Inorganic Materials"); Mr DAVYDOV, Andrei (JSC "Bochvar institute")

Presenter: KRIVOV, Mikhail (Joint Stock Company "A.A. Bochvar High-technology Research Institute of Inorganic Materials")

Session Classification: 3.2 Development of innovative fuels: design and properties irradiation

Track Classification: Track 3. Fuels, Fuel Cycles and Waste Management