Contribution ID: **260** Type: **Verbal**

Ceria Ceramic: Cold Pressing and Sintering or Spark Plasma Sintering?

Friday, 16 May 2014 13:30 (15 minutes)

In connection with the high rates of development of nuclear power engineering a problem of optimizing the process of nuclear fuel production and improving its performances remains relevant. Currently, the main way to obtain UO2 fuel pellets is the method of Cold Pressing and Sintering (CPS). The main disadvantages of this method are large sintering duration (up to several hours) and high temperature of sintering. The innovative method of producing ceramics for various purposes (manufacture lasers, catalysts, semiconductors, dielectrics, biomedical materials, etc.) is the method of Spark Plasma Sintering (SPS). In this method, the powder samples placed in a graphical cuvette are heating with high speed by passing pulses of direct current with simultaneous application of hydrostatic pressure. This method is characterized by high rates of process shrinkage. In the present work ceramic from CeO2 (as analogue of UO2 and as candidate for the inert matrix fuel, IMF, for the transmutation of actinides) was received by CPS and SPS methods and the results were compared. CeO2 powder was prepared by decomposition of cerium nitrate Ce(NO3)3•6H2O (puriss.). SPS method was carried out on the installation Dr.Sinter Model-625. Optimized conditions of sintering of ceramics: - by CPS method: Tsintering=1800oC, P=108.4MPa, t sintering=2 h; - by SPS method: Tsintering=1062oC, P=88.6MPa, t sintering=25 min including cooling. Relative density of the ceramics obtained by CPS method constituted 79.9% of the theoretical, ceramics obtained by SPS method - 95.4%. As can be seen from the received data, ceramics obtained by SPSmethod, has a higher relative density, the sintering occurs at a lower temperature and pressure and in less time. Shrinkage of the sample begins at a temperature of 840oC, finishes at 1060oC, the maximum shrinkage rate (0.02 mm/s) is observed at 940oC. Time of shrinkage is 3.5 min.

Primary author: Ms GOLOVKINA, Lyudmila (Nizhegorodskiy State University)

Co-authors: Prof. ORLOVA, Albina (Nizhegorodskiy State University); Mr RYAKOV, Alexander (FSUE ”PA”Mayak”); Mr NOKHRIN, Alexey (Nizhegorodskiy State University); Mr MANAKOV, Igor (FSUE ”PA”Mayak”); Mr BOLDIN, Maksim (Nizhegorodskiy State University); Mr LOGUNOV, Mikhail (FSUE ”PA”Mayak”); Mr BELKIN, Oleg (Nizhegorodskiy State University); Dr CHUVIL'DEEV, Vladimir (Nizhegorodskiy State University)

Presenter: Ms GOLOVKINA, Lyudmila (Nizhegorodskiy State University)

Session Classification: Chemistry of Nuclear Fuel Cycle 5

Track Classification: Chemistry of Nuclear Fuel Cycle / 1st ASGARD International Workshop