

Melting behavior of MOX under air.

M. Strach, R. Belin, D. Manara, J. Rogez

▶ **To cite this version:**

M. Strach, R. Belin, D. Manara, J. Rogez. Melting behavior of MOX under air.. E-MRS 2015 Spring Meeting, May 2015, Lille, France. cea-02509086

HAL Id: cea-02509086
https://cea.hal.science/cea-02509086

Submitted on 16 Mar 2020

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Melting behavior of MOX under air.

E-MRS Spring Meeting 2015 conference abstract.

M. Strach, R.C. Belin

Atomic Energy and Alternative Energies Commission, DEN, DTEC/SECA

Cadarache F-13108 Saint-Paul-Lez-Durance, France

D. Manara

European Commission, Joint Research Centre, Institute for Transuranium Elements,

P.O. Box 2340, 76125 Karlsruhe, Germany

J. Rogez

IM2NP, UMR 6122, CNRS – Aix Marseille University,

Case 251, Avenue Escadrille Normandie Niemen, 13397 Marseille Cedex 20, France

In order to use mixed U-Pu oxide ceramics in present and future nuclear reactors, their physical and chemical properties need to be well determined. The behavior of stoichiometric $UPuO_2$ compounds is relatively well understood, but the effects of oxygen stoichiometry on the fuel performance and stability are often still obscure. In the present work, a series of laser melting experiments were carried out to determine the impact of an oxidizing atmosphere, and in consequence the departure from a stoichiometric composition, on the melting behavior of six mixed uranium plutonium oxides with Pu content ranging from 14 to 62 wt%. The starting materials were disks cut from sintered stoichiometric pellets. For each composition we have performed two laser melting experiments in pressurized Air, each consisting of four shots of different duration and intensity. During the experiments we recorded the temperature at the surface of the sample with a pyrometer. Phase transitions were qualitatively identified with the help of a reflected blue laser. The observed phase transitions occur at a systematically lower temperature, the lower the Pu content of the studied sample. It is consistent with the fact that uranium dioxide is easily oxidized at elevated temperatures, forming chemical species rich in oxygen, which melt at a lower temperature and are more volatile. To our knowledge this campaign is a first attempt to quantitatively determine the effect of O/M on the melting temperature of MOX.