DEN: Thesis SL-DEN-20-0133

RESEARCH FIELD

Ultra-divided matter, Physical sciences for materials / Condensed matter physics, chemistry & nanosciences

TITLE

Elaboration of actinide oxides solid solution by combustion synthesis

ABSTRACT

This thesis is the result of a collaboration between the Marcoule Institute for Separation Chemistry (ICSM / Marcoule) and the Department of Process Research for Mine and Fuel Recycling (DMRC / Marcoule). This work is in the Framework of the treatment and recycling of spent fuel, particularly in the conversion process which consists in the transformation of actinide nitrates into oxides.

Combustion synthesis is a process that uses the heat produced by a redox reaction between nitrate salts (oxidant) and an organic fuel (glycine, citric acid), to facilitate the formation of a compound that would normally be obtained at higher temperature. The proposed subject, which follows a thesis defended in 2019, has as main objective to transpose the acquired results on the conversion of UO$_2$+x, U0.5-Ce0.5O$_2$+x oxides to real U-PuO$_2$+x compounds. This transposition will consist in optimizing the structural and microstructural characteristics of the powders obtained for the sintering shaping operation, but also in controlling their oxygen stoichiometry. These operations will be carried out in the Atalante facility (CEA Marcoule). A second objective with a more scientific aim will be to study the mechanisms leading to the reduction of uranium during the combustion process. This work will be done at ICSM.

The candidate is a good student of Master 2 or engineering school in Chemistry (type ENSCM, ParisTech) if possible specialized in Chemistry of Materials or Inorganic Chemistry. He will have to be autonomous. He will write reports and participate to meeting (oral presentation of the results) and the possible writing of publications in English.

The double experience acquired through experiments in the hot lab (Atalante) and conventional lab (ICSM) can be valorized to obtain a position in research for the nuclear industry or more generally in the chemical industry.

LOCATION

Département de recherche sur les procédés pour la mine et le recyclage du combustible
Service d’études des procédés de fabrication des matériaux d’actinides
Laboratoire d’études des Procédés des Conversions des Actinides
Place: Marcoule
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CONTACT PERSON

ELEONORE WELCOMME
CEA
DEN/DMRC/LPCA
CEA MARCOULE
BAT 399

Commissariat à l’énergie atomique et aux énergies alternatives
Institut national des sciences et techniques nucléaires
www-instn.cea.fr
BP17171
30207 Bagnoles sur Cèze
Phone number: +33 4 66 33 94 12
Email: eleonore.welcombe@cea.fr

UNIVERSITY / GRADUATE SCHOOL

Montpellier
Sciences Chimiques Balard

THESIS SUPERVISOR

Xavier DESCHANELS
CEA
DEN/ICSM/LNAR
CEA Marcoule
ICSM/ Laboratoire des Nanomatériaux pour l’Energie et le Recyclage (LNER)
CEA Marcoule BP 17171
30207 Bagnoles sur Cèze