



**ESRA Project reference  
number 2015-KRU-E-20-  
000-5333**

**Grain size effects on helium and fission  
product behaviour in UO<sub>2</sub>**

**Position for:**

CATEGORY 20

The preparation of ceramic materials for nuclear applications requires the generation of powders to be compacted and sintered into monoliths, usually in the form of pellets. An important breakthrough is being made at the JRC-ITU with the installation of a Spark Plasma Sintering facility, opening new paths to reach high density fuel samples with hitherto inconceivable microstructures (in the nanometre range) and compositions (e.g. inclusion of volatile fission product simulants) for separate effect tests.

The successful candidate will develop the SPS method to prepare oxide fuels with nano, sub-micron (including high burnup structure (HBS) formed at the periphery of light water reactor fuel) and micron grain sizes. Doping with an alpha emitter (<sup>238</sup>Pu) will open the path for dedicated separate effect safety tests, on helium retention/release in UO<sub>2</sub> as a function of grain size. Traditional characterisation methods (XRD, SEM, TEM) will be combined with other advanced methods (XAS, NMR) and Knudsen cell mass spectrometry to provide detailed information on the structural changes and helium dynamics as function of irradiation damage. In addition ion implantation will be used to augment alpha damage investigations.

**Qualifications:**

CAT. 20: The ideal candidate shall have a university degree giving access to doctoral studies.

**Requirements<sup>1</sup>:**

University degree shall be in chemistry, physics, geochemistry, materials science, materials engineering or nuclear engineering, or comparable.

<b>Institute for Transuranium Elements, E04, E03 Unit</b>	Marco Cologna Thierry Wiss  <a href="https://ec.europa.eu/jrc/en/institutes/itu">https://ec.europa.eu/jrc/en/institutes/itu</a>
<b>Indicative duration<sup>2</sup></b>	36 months
<b>Preferred starting date</b>	01/09/2015 or ASAP
<b>JRC Site</b>	Karlsruhe, Germany
<b>Rules</b>	<a href="https://ec.europa.eu/jrc/sites/default/files/jrc_grant_holder_rules.pdf">https://ec.europa.eu/jrc/sites/default/files/jrc_grant_holder_rules.pdf</a>

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<sup>2</sup> CAT 20: min. 12 months / max. 36 months / CAT. 40: min. 3 months / max. 24 months