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Specification for PYCASSO experiments PIE and associated tools

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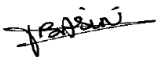
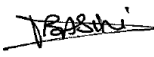
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RAPHAEL (ReActor for Process heat, Hydrogen And ELectricity generation)





ReActor for Process heat, Hydrogen And ELelectricity generation (RAPHAEL)		
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Document title						
SUB-PROJECT FUEL TECHNOLOGY (SP-FT)						
SPECIFICATION FOR PYCASSO EXPERIMENTS PIE AND ASSOCIATED TOOLS						
Executive summary						
A list of Post Irradiation Examination which could be performed on the PYCASSO particles has been defined and the techniques which could be used and where it will be possible to carry out the characterizations is presented.						
Revisions						
Rev.	Date	Short description	Author	WP Leader	SP Leader	Coordinator
00		First issue	V. BASINI CEA	S. De GROOT CEA	V. BASINI CEA	E. BOGUSH FANP
						

1 Purpose

CEA, JAEA and KAERI particles with inert kernels have been irradiated in the PYCASSO¹ irradiation experiments conducted in the PETTEN High Flux Reactor (HFR).

After 5 cycles of irradiation, the experiment has been removed and the NRG hot cells have been dismantled PYCASSO-I and retrieval of the samples. De-assembly of the sample holder has been performed and particles activities have been measured. Although some contamination or sample holder material inclusion in the sample container is likely, generally the particle activities are consistent, and indicate the activities are from the samples, and not by contamination from the sample holder.

CEA sample activity is low. JAEA sample activity is higher. Activity levels can be correlated to the samples: especially ZrO₂ samples show relatively high activity. KAERI sample activity is unexpectedly high, but consistent.

These results lead to the conclusion that the Post Irradiation Examinations (PIE) will have to be performed at least in glove boxes. The list of PIE proposed takes it into account.

2 PYCASSO Post Irradiation Examination

PIE	Techniques	Where	Comments
Diameter/sphericity	Image Analysis on metallographic cross section	HFR	Reference will be necessary to perform comparative measurements between CEA Cadarache (where measurements on non irradiated particles have been performed) and HFR
Thickness	Tomography	HFR	Measurements on 30 non irradiated particles with AREVA facility are necessary to correlate with Image analysis results. Feasibility of these measurements with the HFR device on irradiated particle will have to be checked
Density	Tomography	HFR	Correlation with sink float result will also have to be evaluated.
Anisotropy	Ellipsometry	ITU	Measurements on non irradiated particles are planned in ITU within RAPHAEL project. The device will have to be installed in glove box to be able to perform measurements on irradiated particles.
Microstructural examinations	XRD	HFR	Ok
	SEM/EBSD	HFR	Ok
	TEM	HFR or CEA	TEM on un-irradiated CEA PYCASSO particles has been already performed. This know-how could be exchange with NRG.
Mechanical properties	Crush tests	HFR or ITU	Others techniques could be interesting to develop to be able to measure Young Modulus and SiC strength

¹ PYrocarbon Irradiation for Creep And Swelling/Shrinkage of Objects