

Calculation of the axial transfer of fission gases in the plenum for the design of P2M rods



CONTEXT

The internship is part of the P2M irradiation project hosted in the FIDES network led by the OECD/NEA. The project is led by a "Core Group" made up of EDF, SCK-CEN and CEA. This project aims to perform two power ramps with successive steps until 5 to 15% of melted fuel are obtained. The objective is to refine the knowledge of the mechanisms and phenomena implemented for these high linear power ranges in order to optimize the safety margins and to facilitate the operation of the fuels in power plants.

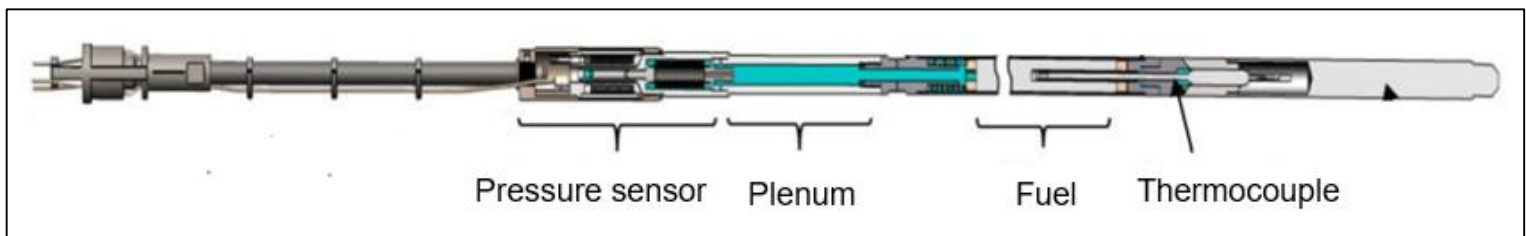
The experimental rods will be manufactured, from rods irradiated in an industrial reactor, at the LECA/STAR (CEA Cadarache), and ramped in the BR2 experimental reactor (Belgium); they will undergo post-irradiation examinations at the LECA/STAR. In order to pre-qualify the two power ramp, a first low power irradiation, P2M-Q1, will be performed in the BR2 reactor at the end of 2023.

OBJECTIVES

The objective of the internship is to contribute to the design of the experimental fuel rods which will include thermocouple type instrumentation to measure the core temperature of the fuel in the lower part and pressure sensor in the upper part. The experimental fuel rod includes a plenum in the upper part in which the fission gases are released during the experiment, this release being one of the important parameters to determine during the irradiation test. For this purpose, a pressure sensor will be used to measure the pressure increase of the gas in the plenum during the test. The objective of the internship will be to determine by calculation the kinetics of the release of the fission gases towards the plenum, with the fuel performance code ALCYONE. The obtained results will be first used to refine the fuel rodlet design (plenum volume). Second, they will be compared to the experimental data issued from the P2M-Q1 irradiation test planned at the end of 2023.

INTERNSHIP STEP

1. Realization of a bibliography on the axial transfer of gases during past-irradiation tests (REMORA and RISOE irradiations)
2. Recalculation of a past irradiation similar to the P2M-Q1 irradiation in order to calibrate the ALCYONE calculation code
3. Calculation of the axial transfer of fission gases during the P2M-Q1 irradiation



P2M-Q1 rod design

Formation required :	Master in engineering	Location :	DEC/SESC/LECIM
Duration :	6 months	Possibility to pursue with a PhD thesis:	No
Calculation tools, computers :	ALCYONE fuel performance code	Contact :	VERNIER Anaëlle – anaelle.vernier@cea.fr
Keywords :	P2M, FIDES, Irradiation ,Simulation, Gases axial transfer, Conception, REMORA		BEJAQUI Syriac – syriac.bejaoui@cea.fr