

## **Mini-test samples for in-service monitoring of structures with application to hydrogen transport**

**“POST-DOC” OFFER IN THE FRAMEWORK OF THE ANR CHAIR “MESSIAH”**

**DURATION:** 2 YEARS

**LOCATION:** CENTRE DES MATERIAUX – CNRS UMR7633 – MINES DE PARIS – PSL RESEARCH UNIVERSITY. EVRY.

**Context :** The MESSIAH program proposes to use mini-tests machined from coupons extracted from facilities to evaluate and monitor the toughness in service. These *in situ* coupons will be small (thickness: 1-3 mm, surface: a few cm<sup>2</sup>). The issues targeted by the project are the aging of the installations and the taking into account of new challenges linked to the decrease of mechanical properties due to hydrogen. The interest in developing this type of methodology lies in the possibility of testing equipment already in place to evaluate their behavior under prospective conditions. Although it is relatively easy to test small tensile samples to determine plastic behavior, the program proposes to go well beyond this objective by developing fracture mechanics tests in the ductile regime and taking into account the effect of hydrogen (current practice being limited to brittle failure). The main difficulty lies in the size effects.

The Chair is conducted with EDF R&D, RICE GRTgaz, Air Liquide, Mannesman Precision Tubes France SAS and Transvalor under the aegis of the ANR.

The Chair has already allowed starting three theses on experimental aspects in relation to the simulation of the experimental database. A fourth thesis is dedicated to the simulation of the effect of hydrogen on the behavior and failure of steels.

**Work program:** The candidate will have to use, in relation to the PhD students and the partners, the methodology of characterization of materials with mini-test samples provided by the participants. "Blind" tests will be performed in order to validate the approach. He/She will be in charge of the management of the database gathering the experimental results. He /She will manage the Chair's website (<https://messiah.minesparis.psl.eu>) in relation to one of the objectives of Chair, which is to disseminate obtained results as well as the recommended methodologies. Finally, he/she will be in charge of the drafting of recommendations on the conduct and interpretation of the tests on mini-specimens. These recommendations are one of the major deliverables of the Chair.

**Required Profile:** A Ph.D. in a specialty related to mechanics of materials is required. The work requires good knowledge of mechanical testing and numerical simulation by finite elements. Very good knowledge of scientific English and excellent writing skills are required. The recommendations will be written in English. The candidate may also be associated with the publications of the Ph.D. students. He/She should also have a good knowledge of the following tools: Python, C++, LaTeX, Linux. Good knowledge of communication and graphic design tools is a plus (website, Twitter, LinkedIn, ...).