

Thesis Title	Contract doctoral/PhD (H/F) - Complex hydrates in the Sea of Marmara: Formation mechanisms, kinetic and thermodynamic property study from Experiments and Modelling
Contract type	Research Training Assistance Contract
Department/Office	Département Ressources Physiques et Écosystèmes du fond de Mer Unité Géosciences Marines /Laboratoire de Cycles Géochimiques et ressources
Duty station	IFREMER-Bretagne 1625 route de Sainte Anne CS 10070 - 29280 Plouzané
Date of issue :	01/03/2021
Doctoral School Thesis supervisor Co-supervisors	École Doctorale des Sciences de la Mer, IUEM, Université de Bretagne Occidentale Thesis supervisor : Livio RUFFINE Co-supervisor : Olivia FANDINO-TORRES
Reference (HRD)	

The Institute and the recruiting department

Ifremer, the French Research Institute for Exploitation of the Sea, is a source of knowledge, innovation, monitoring data and expertise for the marine world, both in terms of public policy and socio-economic activity. The Geosciences Research Unit (UR-GM), attached to the Physical Resources and Sea-Bed Ecosystems Department (REM), is concerned by major scientific, societal and socio-economic issues related to marine geosciences. It is composed of three research laboratories and a service with activities in support of research actions. The Laboratory of Geochemical Cycles and Resources (LCG) works on the understanding of chemical exchanges between the hydrosphere and the oceanic lithosphere; and in particular on the methane cycle on continental margins, with special focus on its accumulation as methane hydrates.

https://www.ifremer.fr/gm_eng/Activities/Laboratory-of-Geochemical-Cycles-and-resources-LGC

Summary

Marine hydrate deposits represent one of the largest methane reservoirs on Earth. They are very sensitive to changes in chemical flux, as well as the temperature and pressure of the seafloor.

Recent studies carried out in the Sea of Marmara (SoM), along the submerged part of the North Anatolian Fault (NFA), show that one of the segments crosses a hydrate deposit sourced by thermogenic gas-charged bodies located in the seismogenic zone. These hydrates are peculiar because they contain a large number of molecules other than methane (non-methane molecules such as heavier hydrocarbons and carbon dioxide) accounting for between 12-17 %-mol. As a result, their formation mechanism is a complex phenomenon that considerably changes (1) the chemical composition and thermodynamic properties of the source gases, and (2) the mechanical properties of the sediment near the fault segment. To date, detailed studies on the formation process and the stability field of such complex hydrates are lacking, especially the formation mechanisms and the kinetics.

This PhD fellowship proposes to study the physicochemical properties of the Marmara hydrate deposit, by applying an integrated approach combining laboratory experiments and modelling. The results will allow a better understanding of their formation mechanisms, their stability field, their gas storage capacity and the heat required to destabilize them.

Key words

Complex gas hydrates, formation mechanisms, high-pressure experiments, kinetics, modelling, stability field, thermodynamics

Expected profil

Applicants should have a M. Sc. degree in chemistry, chemical engineering or geochemistry and, preferably a good knowledge in the area of gas hydrates, geosciences or chemical processes. We are seeking a student interested in both experimental studies and modelling, and who is willing to carry out high-pressure experiments followed by modelling optimization. The successful candidate should have the ability to explain in English his / her work on paper and in face-to-face meetings.

Specific working conditions

- This PhD project is a collaboration between Ifremer, the University of Nova Lisboa (Portugal) and the University of Vigo (Spain). The recruited candidate will carry out an internship in each of these two universities.
- Full time
- Possibility to participate in a sea cruise

This PhD project is a real opportunity to work on Ifremer's scientific and technological priority themes. It entitles the holder to a gross monthly salary of 1900 euros for a period of 3 years, which cannot be combined with other scholarships.

How to apply for this position ?

Your application file must include :

- a curriculum vitae
- a covering letter
- a reference letter
- an academic transcript (Bachelor + Master 1 and first semester Master 2)

Your application must be **compiled into 2 PDF files, up to 1.5 MB for each file:**

In case of any problem in attaching your documents, please upload your CV on this page (this step is mandatory for your application to be considered) and send all the documents to the thesis supervisors : **livio.ruffine@ifremer.fr** and **olivia.fandino.torres@ifremer.fr**

The deadline for applications is May 2nd, 2021. Nevertheless, we strongly urge you to let us know as soon as possible of your intention to apply, by contacting the supervisors.

Doctoral students' contract will start October 1st, 2021, subject to the submission of administrative documents authorizing Ifremer to recruit the doctoral student (certificate of completion of the Master 2 or engineering degree + visa for foreign doctoral students outside the EU).

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