

**Optimization of the valorisation of pearl oyster co-products  
in cementitious materials  
(PINCTADA-2 project)**

### **NewPores International Hub presentation**

*NewPores* is an international hub dedicated to the mechanics and physics of porous materials, which intends to answer to new Energy and Environment challenges. This is a joint effort of the group on Mechanics and Physics in Porous Media (MPPM) of the LFCR lab (UMR5150) at E2S UPPA (France), the Centre for Sustainable Engineering of Geological and Infrastructure Materials (SEGIM) at Northwestern University (USA), the University of Vigo (Spain), the Technical University of Madrid (Spain) and University of Liège (Belgium).

### **General context**

Within the *Hub Newpores*, the PINCATADA-2 project aims to address the emerging challenges related to environment by enhancing the performance and reducing the environmental impact of concrete and mortar materials. It will be achieved by incorporating crushed seashell waste in a local and circular economy approach.

The exploitation of the black-lipped pearl oyster (*Pinctada Margaritifera*) has been one of the main resources of French Polynesia for more than two centuries. Careful management of the “mother-of-pearl” nacre stock and the environment in which it is farmed, as well as a measured response to changing economic factors, are necessary to maintain a sustainable industry. In particular, the natural farming of *Pinctada Margaritifera* is subject to competition from a smaller natural species, *Pinctada Maculata*, and the pearl industry produces seashell wastes of the two species. If the nicer seashell can be reused by local arts and crafts, broken, sick or smaller seashell are usually dumped or burned with important environmental issues. Different strategy of valorisation of these wastes into co-products are envisioned by the local authorities (e.g. agriculture) and this project focuses on the reuse of seashell waste to produce more sustainable cementitious materials.

Incorporating seashell co-products into cement matrices by controlling upstream heat treatments to benefit from their potential performance is very innovative and has been tested in the project team on different shellfish (Arcachon oysters, scallops or Polynesian pearl oysters). In particular, the first PINCTADA project has already made it possible to transfer the knowledge acquired on the recovery of Arcachon oyster waste into Polynesian oyster waste (*Pinctada Margaritifera* and *Pinctada Maculata*) and a concrete formulation has been designed which is compatible with an implementation on Polynesian atolls in the context of non-structural applications.

### **Global project objectives**

In this context, the PINCTADA-2 project aims to set up in the Tuamotu archipelago a demonstrator that provides a proof of concept for the possible valorisation of Polynesian shellfish wastes through a non-structural concrete whose skeleton is composed of 100% locally crushed *Pinctada Maculata* and/or *Pinctada Margaritifera* waste. In addition, the second objective is to propose mixed formulations (crushed shellfish/conventional aggregates) whose mechanical properties make it possible to target structural applications from materials traditionally used in French Polynesia.

### **Postdoc candidate objectives**

Within the PINCTADA-2 project, the Postdoc candidate will be responsible for analysing the ground materials produced on site, defining the installation site, implementing the non-structural demonstrator and monitoring the evolution of its mechanical properties. At the same time, he will also be in charge of a preliminary study of partial substitution by classic French aggregates, of the formulation of a mixed *Pinctada* / basalt aggregate concrete and of a mixed *Pinctada* / coral aggregate concrete, both produced and characterized in Polynesia.

### **Partners**

**DRM** (*Direction des Ressources Marines de Polynésie Française*), **REC** (Délégation à la Recherche de la Polynésie française), **Polynacre**.

**Contact : Pr David Grégoire**

UPPA - ISA BTP – IPRA - LFCR

Campus Montaury – Côte Basque

64600 Anglet, France

[www.davidgregoire.fr](http://www.davidgregoire.fr)

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### Candidate's profile

The candidate should hold a PhD degree in civil engineering. Note that the candidate could be in the process of obtaining his PhD degree during the application process, but the PhD defense must have occurred before the actual starting date of the postdoc position. Previous experience with seashell concrete formulation and validation is mandatory. The candidate should have a strong interest in performing experimental work in a multi-disciplinary and international team. Proficiency in English (B2 minimum) is mandatory for both oral and writing communication. Proficiency in French (B2 minimum) is also mandatory for both oral and writing communication. Knowledge of the French Polynesian territory and its specificities will be an asset as well as a real working autonomy. Effective scientific article writing skills will be an asset.

### Job details

The successful candidate will be hosted half time at ISABTP Civil Engineering School by LFCR (UMR5150, UPPA-CNRS) in Anglet, France, and half time by the DRM in Tahiti, French Polynesia. Temporary hosting in the Tuamotu archipelago may be necessary for the proper implementation of the non-structural demonstrator. The Postdoc candidate will be fully supervised by Prof. David Grégoire. The envisioned starting date is January 6<sup>st</sup>, 2025, and the contract will necessary end on October 31<sup>st</sup>, 2025. The position includes full social security coverage and a gross salary of approx. 3000 € per month. Housing in French Polynesia will not be covered and it will remain at the charge of the Postdoc candidate.

### Evaluation procedure

Candidates will be ranked in a first phase based on their submitted application.

In a second phase, a visioconference interview will be organised with the pre-selected candidates.

Applications should include a cover letter, CV, passport/ID copy, transcripts of diplomas and lists of courses attended (with grades obtained), recommendation letters, and names and contact details of at least two references.

Applications should be submitted from October 1<sup>st</sup>, 2024 at [www.davidgregoire.fr/opening-positions](http://www.davidgregoire.fr/opening-positions) .

Application deadline: October 31<sup>th</sup>, 2024, 23:59 CET.

The interview will take place on November 8<sup>th</sup>, 2024.

Final answer will be provided by November 12<sup>th</sup>, 2024.

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