

## **Description of Postdoc 2:**

### **Postdoctoral Research Associate in Pattern Formation in Alkaline Geochemistry**

Applications are invited for a postdoctoral research position (PRA) funded by the ERC Advanced Grant “Pattern formation and mineral self-organization in highly alkaline natural environments”, within the laboratory of [Professor Juan Manuel Garcia-Ruiz](#) at the Andalusian Institute of Earth Sciences (IACT) located in Granada, Spain, a joint Research Centre of the National Research Council CSIC, the biggest research institution in Spain, and the University of Granada. The laboratory of Prof. Garcia-Ruiz holds an international and multidisciplinary environment with research focused in crystallization, pattern formation and mineral self-organization. The Laboratory is fully equipped to carry out the project and is integrated within a very dynamic environment, close to the Life Sciences Technological Park of Granada and with direct access to all the facilities of the Scientific Instrumentation Centre (CIC) of the University of Granada.

### **Description of the job:**

The successful candidate will explore the precipitation of carbonate in alkaline silica rich solutions in active alkaline natural systems under different geochemical environments, including among others: a) vents and allied petrological facies in the brucite-dominated submarine vents in New Caledonia, b) alkaline thermal vents and lakes of the Rift Valley in Africa; c) alkaline waters sampled from all around the world. The work will involve the organization of the fieldtrips including protocols for sampling in alkaline waters; b) chemical and physical characterization of water chemistry and aqueous thermochemistry; c) the search for self-assembled structures with life-like morphologies or textures mimicking those induced by life; d) Comparing the results with structures arising from ancient alkaline, among them those found in Dresser formation; e) Contribute to the theoretical analysis of geological scenario optimising the coupling of geochemical reactions known to yield organic compounds and the formation of self-assembled mineral structures.

**Duration:** Funding is available for 1 year in the first instance (starting any time between the first of June and the first of October 2014) with the possibility of extension for another 3 years upon mutual satisfaction.

**Requirements:**

- A PhD in **Earth Sciences, Physics, Chemistry, Material Sciences** with specialisation in **Aqueous Geochemistry and/or Mineral growth**.
- Strong background in **Geochemistry and/or Mineral growth** and a track record of publication in peer-reviewed journals in relevant topics.
- Experience with crystallization techniques; optical microscopy methods, X-ray diffraction methods (tomography, dispersion spectrography, etc.), and micro-Raman. Knowledge of atomic absorption spectrometry, UV-MS, ICP-MS, chromatography, mass spectrometry, thermometry and trace elements and isotope geochemical fingerprinting would also be an advantage.
- Proven ability to work effectively as part of a collaborative team and independently. Organize and participate in the fieldwork campaigns.
- Excellent oral and written communication skills.
- Adaptability and flexibility to support evolving and constantly changing research needs.
- Demonstration of self-motivation, organisation and a willingness to acquire new skills through training and personal development.
- Capability to supervise PhD students.

**Contact details:**

Interested candidates should send before the April 15 their CV and two reference letters along with a letter of interest explaining her/his skills and why he/she wishes to join the PROMETHEUS team. Please send all the correspondence to Prof. Juan Manuel Garcia-Ruiz's email: [juanmanuel.garcia@csic.es](mailto:juanmanuel.garcia@csic.es); Phone: +34 958230000; ext. 190201 for additional information about the project see (<http://garciaruiz.net/prometheus>).

**General description of the ERC Project (PROMETHEUS):** The precipitation of alkaline-earth carbonates in silica-rich alkaline solutions yields nanocrystalline aggregates that develop non-crystallographic morphologies. These purely inorganic hierarchical materials form under geochemically plausible conditions and closely resemble typical biologically induced mineral textures and shapes, thus the name 'biomorphs'. The potential interest of these fascinating structures in Earth Sciences has never been explored mostly because of their complexity and multidisciplinary nature. PROMETHEUS aims to carry out an in depth investigation of the nature of mineral structures such as silica biomorphs and chemical gardens and the role of mineral self-organization in extreme alkaline geological environments. The results will impact current understanding of the early geological and biological history of Earth by pushing forward the unexplored field of inorganic biomimetic pattern formation. The ambitious research program will require the development of high-end methods and instruments for the non-intrusive *in-situ* characterization of geochemically important variables, including pH mapping with microscopic resolution, time resolved imaging of concentration gradients, microscopic fluid dynamics and characterization of ultraslow growth rates.