

A postdoc project proposal 2021 –

Developing methods for surface modification

A call for a one-year postdoc, with possibility of extension to a second year, in the joint research laboratory between TOTAL - one of world's leaders in oil and gas, and ESPCI - french top research institution. The postdoc will be located in ESPCI (Paris) with visits to the R&D center of TOTAL in Lacq (PERL – Pôle d'Etudes et de Recherche de Lacq), in the southwest of France.

Scientific project :

The interaction between liquids, solids and additives plays a key role in variety of applications. One example is oil recovery, where the wettability of the rock is altered by interactions on the interface, often in the presence of surfactants. Numerous additional examples include efficiency of ceramic membranes for water treatment, surface interactions during CO₂ capture, etc. The exact mechanisms are unknown, and the problem remains a challenge for both scientists and engineers.

One way to address it is in laboratory scale experiments on model systems, in particular in microfluidics. Successful experimental modeling is key, and in particular the surface properties of solids, which depend on the application. On the other hand using real surfaces, e.g. carbonate rocks, is disadvantageous, as experimental systems need to be transparent. Various methods exist to generate proper model systems, one of them is via surface functionalization, either in-situ or ex-situ [1].

The goal of the postdoc will be first to develop a protocol for coating a glass surface with thin layer of calcium carbonate of controlled properties, followed by elaborate surface characterization. In particular homogeneity of the coating and the thickness of the layer, affecting the optical properties, will be evaluated. In case of fast progress additional surface modifications (zirconia) can be developed.

Methods :

Surface chemistry, characterization methods (AFM, SEM, image analysis, spectroscopy), microfluidics

Required profile :

PhD in physical chemistry, chemistry, chemical engineering

Strong background in surface functionalization and/or characterization is an advantage.

Independence and creativity in problem solving

Out-of-the box thinking, solid technical skills

Duration : 1 year; **Starting date** : Immediate

Location : Lacq or Paris, France

Contacts :

TOTAL

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References :

[1] W.Wang et al., Toward Reservoir-on-a-Chip: Fabricating Reservoir Micromodels by insitu Growing Calcium Carbonate Nanocrystals in Microfluidic Channels, ACS Appl. Mater. Interfaces 2017, 9, 34, 29380–29386