Direction
des **ressources humaines**
Université de Strasbourg

Position description

1. Position identification

Title of post : Researcher in Organic/Organometallic Chemistry

Type of contract : Fixed-term researcher contract

Category (A,B or C) : A

Contract/project period : 12 months **Expected date of employment :** 01/12/2024

Proportion of work : Full time

Workplace : Institut Charles Sadron (ICS), SAMS team

Desired level of education : Doctorate

Experience required : Less than 3 years since the PhD defence

Contact(s) for information on the position (identity, position, e-mail address, telephone) :
Cristina Cebrián Ávila, MCF, ccebrianavila@unistra.fr, +33 (0) 3 88 41 40 14.

Date of publication : 25/07/2024

Closing date for the receipt of applications : 15/09/2024

2. Research project or operation

In the search for advanced functional materials, one of the most promising strategies is to encode the target functionalities at the molecular level, which can be transposed to the macroscopic level by means of appropriate supramolecular organizations.

Nowadays, one of the most innovative concepts in this field deals with the use of molecular machines capable of producing mechanical work in response to different external energy sources, like the protein engines essential to the functioning of living systems.[1] In this context, our team (SAMS, directed by Prof. N. Giuseppone) recently demonstrated that the continuous unidirectional rotation of molecular motors[2] under light irradiation can be amplified at different scales, resulting in a modulation of the mechanical properties of the materials in which they are incorporated.[3] The exploitation of these properties allowed the preparation of artificial muscles,[4] the manipulation of the response of human immune cells by mechanotransduction,[5] the acceleration of ion transport through phospholipid membranes,[6] or for the effective resorption of β-amyloid structures by nanomechanical action.[7]

A current limitation to this approach is that most of these molecular motors are activated by UV light, with wavelengths within the 350-400 nm range. Thus, as part of an IdEx 2024 funding from the University of Strasbourg, this project aims to explore visible light activation strategies for molecular motors integrated in smart materials, with a special focus devoted to photoactive organometallic systems. Several collaborations, within the ICS but also elsewhere, will be considered for the complete optical, electronic and physical characterization of the resulting materials upon incorporation of the developed photo-activating systems.

[1] V. Balzani, A. Credi, F. M. Raymo, J. F. Stoddart, *Angew. Chem. Int. Ed.* **2000**, *39*, 3348–3391.
[2] M. Baroncini, S. Silvi, A. Credi, *Chem. Rev.* **2020**, *120*, 200–268.
[3] Q. Li, G. Fuks, E. Moulin, M. Maaloum, M. Rawiso, I. Kulic, J. T. Foy, N. Giuseppone, *Nat. Nanotechnol.* **2015**, *10*, 161–165.
[4] A. Perrot, W. Wang, E. Buhler, E. Moulin, N. Giuseppone, *Angew. Chem. Int. Ed.* **2023**, *62*, e202300263.
[5] W.-Z. Wang, L.-B. Huang, S.-P. Zheng, E. Moulin, O. Gavat, M. Barboiu, N. Giuseppone, *J. Am. Chem. Soc.* **2021**, *143*, 15653–15660.
[6] Y. Zheng, M. K. L. Han, R. Zhao, J. Blass, J. Zhang, D. W. Zhou, J.-R. Colard-Itté, D. Dattler, A. Çolak, M. Hoth, A. J. García, B. Qu, R. Bennewitz, N. Giuseppone, A. del Campo, *Nat. Commun.* **2021**, *12*, 3580.
[7] D. Daou, Y. Zarate, M. Maaloum, D. Collin, G. Fleith, D. Constantin, E. Moulin, N. Giuseppone, *Adv. Mater.* **2024**, *36*, e2311293.

3. Activities

➢ **Description of the research activities :**

- Prepare, evaluate and select organometallic systems allowing the photoactivation of molecular motors in solution.
- Optimize the preparation of hybrid polymeric materials upon incorporation of the prepared photoactivating systems.
- Characterize the resulting hybrid materials.

➢ **Related activities :**

4. Skills

➢ **Qualifications/knowledge** :

The ideal candidate must have a PhD in molecular chemistry with a solid knowledge in organic and organometallic synthesis. Additional knowledge of photophysics and/or (nano)materials science will be appreciated.

➢ **Operational skills/expertise :**

- Multi-step synthesis in organic/organometallic chemistry, and related purification and characterization techniques
- Inert atmosphere (Schlenk) techniques
- Bibliographic research
- Excellent oral and written communication skills in English
- Project management skills (planning, organizing, time management)

➢ **Personal qualities :**

- Curiosity
- Autonomy
- Rigour
- Commitment and sense of responsibility towards the project
- Ability to work in a team in a multidisciplinary project

5. Environment and context of work

➢ **Presentation of the laboratory/unity :**

The research developed within the **Self-Assembled Molecular Systems (SAMS) team**, led by Professor Nicolas Giuseppone, occupies a predominant position in the field of supramolecular chemistry, ranging from self-assembled polymers to dynamic combinatorial chemistry and, more recently, to molecular machines and motors. In particular for the latter, the significant progress achieved by the team has allowed to obtain several major European grants (ERC, FET-Open and several MSCA) with a network of world-renowned collaborators (including 4 Nobel Prize winners).

The SAMS team is part of the **Institute Charles Sadron (ICS)**, which is a CNRS laboratory (UPR 22) associated with the University of Strasbourg (Unistra) and the National Institute of Applied Sciences of Strasbourg (INSA). This multidisciplinary unit covers topics such as molecular and supramolecular chemistry, physico-chemistry and materials physics (including polymers), as well as self-assembled systems.

Thus, the successful candidate will benefit from a **highly stimulating scientific environment** within a project at the crossroads between molecular and supramolecular chemistry, and materials science.

➢ **Hierarchical relationship :**

The work will be developed within the SAMS team at the ICS under the supervision of Cristina Cebrián Ávila and Rémi Plamont.

➢ **Special conditions of practice (notice attached):**

- Risks related to chemical handling and synthesis.
- Possibility of short stays in other laboratories for characterization measurements.

To apply, please send a detailed CV with the list of publications, a short research report, a cover letter and two letters of recommendation to:

Cristina Cebrián Ávila (ccebrianavila@unistra.fr)