Postdoctoral Scientist Offer

Molecular Memory with Phase Change Coordination Polymers

Advisor: Dr. Aude Demessence

Sustainable Chemistry: from fundamental to applications Group
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IRCELYON
Institut de recherches sur la catalyse et l'environnement de Lyon

A two-year postdoctoral position is available for an exceptional candidate to conduct leading edge research in the new and existing domains of phase change coordination polymers and molecular memory. This is an international French-Japanese research project supported by the ANR-JST. The research work will be carried out part time at IRCELYON, France, with Dr. Aude Demessence and part time at Kyoto University, Japan, under the guidance of Dr. Satoshi Horike.

Every day, we create 2.5 quintillion (2.5 10^{30}) bytes of data, so much that 90% of the data in the world today has been created in the last two years alone. The potential discovery of a universal memory that exhibits fast access speed, high-density storage, and non-volatility has fueled research into Phase-Change Random Access Memory (PCRAM) with the class of chalcogenide phase-change materials. The process of rapid phase change involved in the writing and erasing of data in optical recording is presently induced by a purely thermal process using nanosecond laser pulses: heating of the material leads to the formation of a molten phase and subsequently the crystalline (SET) or amorphous (RESET) state, depending on the cooling speed. Then the reading utilizes the difference of the two phases in electric resistivity and refractive index. Although chalcogenides have some limitations, regarding the cyclability, the temperatures of crystallization-amorphization, the roughness, they are quasi the only phase-change materials tested for PCRAM. To overcome the physical limitations of these inorganic solids, we have developed new materials that are **Multifunctional Phase Change Coordination Polymers (PCCPs)** to be studied for as new PCRAM.

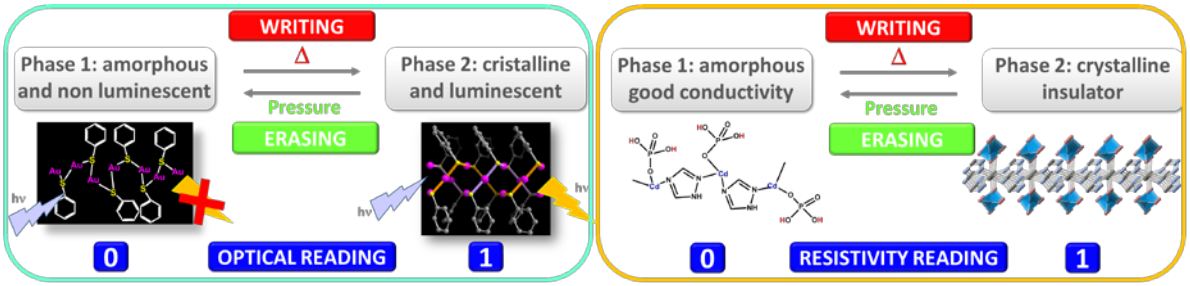

Figure 1. Examples of PCCPs developed in the project.

Based on the first PCCPs isolated by the French and Japanese teams (Fig. 1),[1] the candidate's objectives will be to develop new PCCPs and fully characterize their crystalline and amorphous phases by different techniques (PXRD, PDF, TGA, DSC, FT-IR, XPS, EXAFS, solid state NMR) as well as their physical properties (photoluminescence and/or conductivity). The phase transition kinetics and thermodynamics will also be investigated. This interdisciplinary project represents a new strategy towards the design of innovative PCRAM and provides an opportunity to develop both novel functional and nanostructured hybrid materials.

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The ideal candidate for this two-year position should have a Ph.D. degree with a strong background in coordination chemistry and be comfortable with several physical characterizations mentioned above. The applicant should also be fluent in English and be enthusiast to spend few months in Kyoto University, Japan.

This is a full-time, fixed term contract funded by the national researches agency (ANR) and with a likely start date on January 2017. The salary will be in the range of 21000-24000 € per year after tax.

To apply: Send a cover letter, CV and contact information for references to Dr. Aude Demessence (aude.demessence@ircelyon.univ-lyon1.fr).

1. C. Lavenn; L. Okhrimenko; N. Guillou; M. Monge; G. Ledoux; C. Dujardin; R. Chiriac; A. Fateeva; A. Demessence, *J. Mater Chem. C*, 2015, **3**, 4115. W. Chen, S. Horike, D. Umeyama, N. Ogiwara, T. Itakura, C. Tassel, Y. Goto, H. Kageyama, S. Kitagawa *Angew. Chem. Int. Ed.*, 2016, **55**, 5195.

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