Postdoctoral fellow (M/F): Spark Plasma Sintering of Spin Crossover composite ceramics and study of their thermal conductivity

Start date: 1st October 2025
Duration: 30 months
Salary: 2800€ to 4000€ gross salary depending on experience

Missions

The mission of the postdoctoral fellow will be to study and optimize the thermal conductivity of spin crossover (SCO) materials for barocaloric applications. The thermal conductivity will be measured with the laser flash method. One of the strategies identified to improve the thermal conductivity is to elaborate, via low temperature Spark Plasma Sintering (SPS), a composite ceramic with the spin crossover compound as a matrix and highly thermally conducting charges.

Context

This postdoctoral fellow is funded by the European Pathfinder project FROSTBIT (2024-2028). This project is led by ICMCB-CNRS (France), with 5 partners: University of Nancy (France), University of Tours-GREMAN (France), University of Catalunya (Barcelona), Joseph Stephan Institut (Slovenia). Recent publications evidence colossal barocaloric effects in spin crossover molecular complexes [1]. The FROSTBIT project overall objective is to develop the first operative refrigerator based on a radically new solid-state technology by using barocaloric materials in a regenerative cooling device. One of the more specific objectives is to shape spin crossover materials by Spark Plasma Sintering [2] to obtain densified objects with centimetric sizes, study extensively their thermal, mechanical and barocaloric behaviour and explore the optimization of those properties through the preparation of composites ceramics.

[1] K. Lünser, E. Kavak, K. Gürpinar *et al.* Elastocaloric, barocaloric and magnetocaloric effects in spin crossover polymer composite films. *Nat Commun* **15**, 6171 (2024)
[2] F. Delorme, C. Chen, B. Pignon, F. Schoenstein, L. Perriere, F. Giovannelli. Promising high temperature thermoelectric properties of dense $Ba_2Co_9O_{14}$ ceramics. *Journal of the European Ceramic Society* **37**, 7 (2017)

Activities

The project will focus on the sintering conditions of spin crossover composite ceramics by low temperature Spark Plasma Sintering process in collaboration with ICMCB- Bordeaux. The goal is to improve the thermal conductivity of the ceramics. The thermal conductivity will be calculated from thermal diffusivity (laser flash) and heat capacity (DSC) measurements.

Skills

The candidate must hold a PhD in materials science (or equivalent) and have experience in thermal conductivity measurements and/or in Spark Plasma Sintering. Knowledge of molecular materials would be appreciated. Good communication and writing skills, including English, are required.

Work environment

The postdoctoral researcher will work at GREMAN (UMR CNRS 7347) in Blois. GREMAN has a strong expertise in the measurement of thermal transport in solid materials and in different sintering strategies, including Spark Plasma Sintering. More information can be found on our website: https://greman.univ-tours.fr/

Recruitment process:

1) Pre-selection (deadline 6 July 2025): The candidate must send by email to the scientific supervisors the following documents:
- Cover letter (maximum 2 pages);
- Detailed CV;
- Copy of PhD degree;
- Contact of PhD supervisor(s);
- Any other information needed to assess the application.

All applications will be reviewed promptly, and the most promising candidates will be invited to an interview by the scientific directors.

2) Interview with the scientific supervisors (June-July 2025, at GREMAN or remotely): each candidate will have 15 minutes to present their previous experience, followed by a 30-minute discussion.

Scientific supervisors:

Guillaume Nataf (CNRS Researcher), guillaume.nataf@univ-tours.fr

Fabien Giovannelli (Associate Professor) fabien.giovannelli@univ-tours.fr