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► **To cite this version:**

Marlène Palluel, Yaowei Hu, Matthieu Picher, Ngoc Minh Tran, Nathalie Daro, et al.. Spin crossover nano(hybrid)particles: from synthesis to time-resolved characterization of individual particle by ultrafast transmission electron microscopy. International Conference on Spin Transition - 1st ICST 2023, International Research Organization for Advanced Science & Technology; Kumamoto University, Dec 2023, Kumamoto, Japan. hal-04630449

HAL Id: hal-04630449

<https://hal.science/hal-04630449v1>

Submitted on 1 Jul 2024

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Spin crossover nano(hybrid)particles: from synthesis to time-resolved characterization of individual particle by ultrafast transmission electron microscopy

Marlène Palluel¹, Yaowei Hu², Hilaire Mba², Matthieu Picher², Ngoc Minh Tran³,
Nathalie Daro¹, Stephane Mornet¹, Laurentiu Stoleriu⁴, Cristian Enachescu⁴,
Eric Freysz³, Florian Banhart², Guillaume Chastanet¹



1. ICMCB, Univ. Bordeaux, CNRS, Bordeaux INP, UMR 5026, F-33600, Pessac, France.
2. IPCMS, UMR 7504, Université de Strasbourg, CNRS, F-67034 Strasbourg, France.
3. LOMA, Univ. Bordeaux, CNRS, UMR 5798, F-33405 Talence, France
4. Faculty of Physics, Alexandru Ioan Cuza University, 700506 Iasi, Romania
guillaume.chastanet@icmcb.cnrs.fr

There are many phenomena that can be used to store data, such as the change in electronic configuration in the so-called spin crossover materials (SCO) that is associated to volume change (up to 10%). These can be miniaturized in nanoparticles, in particular for their integration into opto- electronic [1], while maintaining a crucial memory effect to store information, especially by light. This photo-inscription requires high irradiation energies. It is the heat deposited by the irradiation that induces a local heating effect and allows the switching at room temperature.

In this work, we wanted to reduce the irradiation energy required for this photothermal effect, by introducing gold nanorods (70x25 nm) into switchable particles to create Au@SCO nanohybrids (200x100 nm). Excitation of the plasmon resonance of these gold particles amplifies the local heating effect. This strategy reduced the irradiation power by a factor of 10 000 compare to the literature [2]. Energy and photoswitching gain time were studied by time-resolved optical measurements as well as by ultrafast single-particle transmission electron microscopy (UTEM) by probing the size change of an individual particle under a few nanosecond laser pulse [3,4].

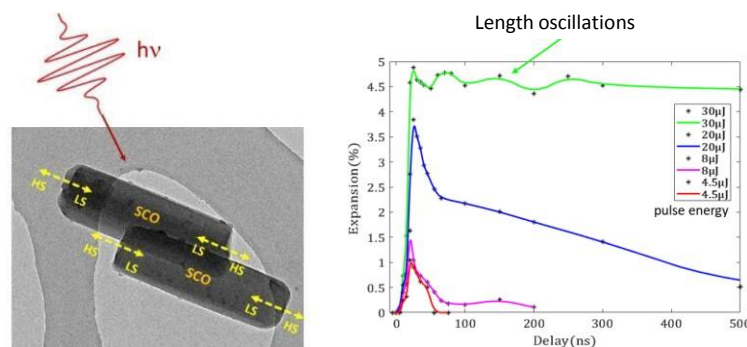


Figure 1. Study of the size change of individual SCO nanoparticle upon photoexcitation using ultrafast transmission electron microscopy.

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Acknowledgment: The ANR is acknowledged for funding this work (Flowswitch, HEROES and Nanoheaters projects).