

Studying nanomaterials with remarkable properties using advanced x-ray spectroscopies

Amélie Juhin* and co-authors in references below

Institut de Minéralogie, Physique des Matériaux et Cosmochimie (IMPMC), CNRS-Sorbonne Université, 4 Place Jussieu 75252 Paris Cedex 5

* amelie.juhin@sorbonne-universite.fr

X-ray spectroscopies performed at synchrotron light sources, such as X-ray Absorption Spectroscopy and Resonant Inelastic X-ray Scattering are powerful tools to study complex materials, due to their chemical selectivity that allows disentangling the respective contributions of different atomic species. In this talk, I will show how the use of incident polarized x-rays (either linear or circular) can allow a deeper understanding of the electronic structure and reveal emergent properties, with a focus on remarkable magnetic nanomaterials: Single Molecule Magnets [1], bimagnetic nanoparticles [2], ferrofluids [3], ultra-thin nanowires [4]. Moreover, I will illustrate how the combination of these spectroscopies with x-ray microscopies (scanning transmission x-ray microscopy, ptychography) can provide valuable information with nanoscale spatial resolution, exemplified by recent results obtained on magnetotactic organisms [5].

[1] L. Poggini, E. Tancini, C. Danieli, A.L. Sorrentino, G. Serrano, A. Lunghi, L. Malavolti, G. Cucinotta, A.L. Barra, A. Juhin, M.A. Arrio, W. Li, O. Otero, P. Ohresser, L. Joly, J.P. Kappler, F. Totti, P. Saintavit, A. Caneschi, R. Sessoli, A. Cornia & M. Mannini. *Advanced Materials Interfaces* **8**, 2101182 (2021)

[2] N. Daffé, M. Sikora, M. Rovezzi, N. Bouldi, V. Gavrilov, S. Neveu, F. Choueikani, Ph. Ohresser, V. Dupuis, D. Taverna, A. Gloter, M.-A. Arrio, Ph. Saintavit, and A. Juhin. *Advanced Materials Interfaces* **4**, 1700590 (2017).

[3] N. Daffé, J. Zečević, K. N. Trohidou, M. Sikora, M. Rovezzi, C. Carvallo, M. Vasilakaki, S. Neveu, H. Meeldijk, N. Bouldi, V. Gavrilov, Y. Guyodo, F. Choueikani, V. Dupuis, D. Taverna, Ph. Saintavit, and A. Juhin. *Nanoscale* **12**, 11222-11231 (2020).

[4] X. Weng, M. Hennes, A. Juhin, Ph. Saintavit, B. Gobaut, E. Otero, F. Choueikani, Ph. Ohresser, T. Tran, D. Hrabovsky, D. Demaille, Y. Zheng, and F. Vidal. *Physical Review Materials* **6**, 046001 (2022).

[5] D. M. Chevrier, A. Juhin, N. Menguy, K. Benzerara, R. Belkhou, M. Kojadinovic-Sirinelli, P. Soto-Rodriguez, E. Pereiro, C. L. Monteil, C. T. Lefevre, in preparation.