ESRF	**Experiment title:** Study of intracellular magnetosome degradation in 3D models of human lung carcinoma cells	**Experiment number**: LS-2966
Beamline: BM23	**Date of experiment**: from: 29/06/2021 to: 02/07/2021	**Date of report**: 13/09/2021
Shifts: 9	**Local contact(s)**: Thomas Buslaps	*Received at ESRF:*

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Report:

Magnetosomes are magnetite (Fe_3O_4) nanoparticles (≈40 nm size) synthesized by magnetotactic bacteria. They are being studied for biomedical applications such as magnetic hyperthermia for cancer treatment or localized drug delivery via magnetic field guiding. Here we plan to shed light on the degradation process of magnetosomes inside cells by means of Fe K-edge XANES spectroscopy. This technique will allow us to track the structural and electronic changes undergone by the Fe atoms inside cells in the long term, up to 20 days after magnetosome uptake.

The samples were prepared at our home institution: cells were fixed, lyophilized and enclosed into kapton foil and in this shape were taken to the ESRF.

Measurements were performed at 10 K to avoid radiation damage. Due to the low Fe content of the samples, measurements were carried out in fluorescence mode, with the sample at 45º to the beam. The monochromator used was Si 111 and we used a 13-element solid state detector. Depending on the Fe content of the sample, we recorded between 5-7 scans per sample. Standards were measured in transmission. All measurements were performed on the Fe K-edge and scans extended up to $k = 9$ Å^{-1}. When the signal-to-noise ratio was good, we could also measure EXAFS spectra up to $k = 14$ Å^{-1}.

No incidences occurred during the experiment. We are very satisfied with the high quality data we obtained and we presume these results will soon be published. We could identify the Fe phases intervening in the degradation process of the magnetite nanoparticles. We are complementing the XANES data obtained at BM23 with previous experiments carried out at the ALBA synchrotron (CLAESS beamline) together with magnetic, TEM and ICP-AES carried out at our home institution.