ESRF	**Experiment title:** Iron sulfide biomineralization in magnetotactic bacteria	**Experiment number**: SC-4573
Beamline: ID26	**Date of experiment**: from: 5/7/2017 to: 10/7/2017	**Date of report**: 24/7/2017
Shifts: 15(18)	**Local contact(s)**: Blanka DETLEFS	*Received at ESRF:*

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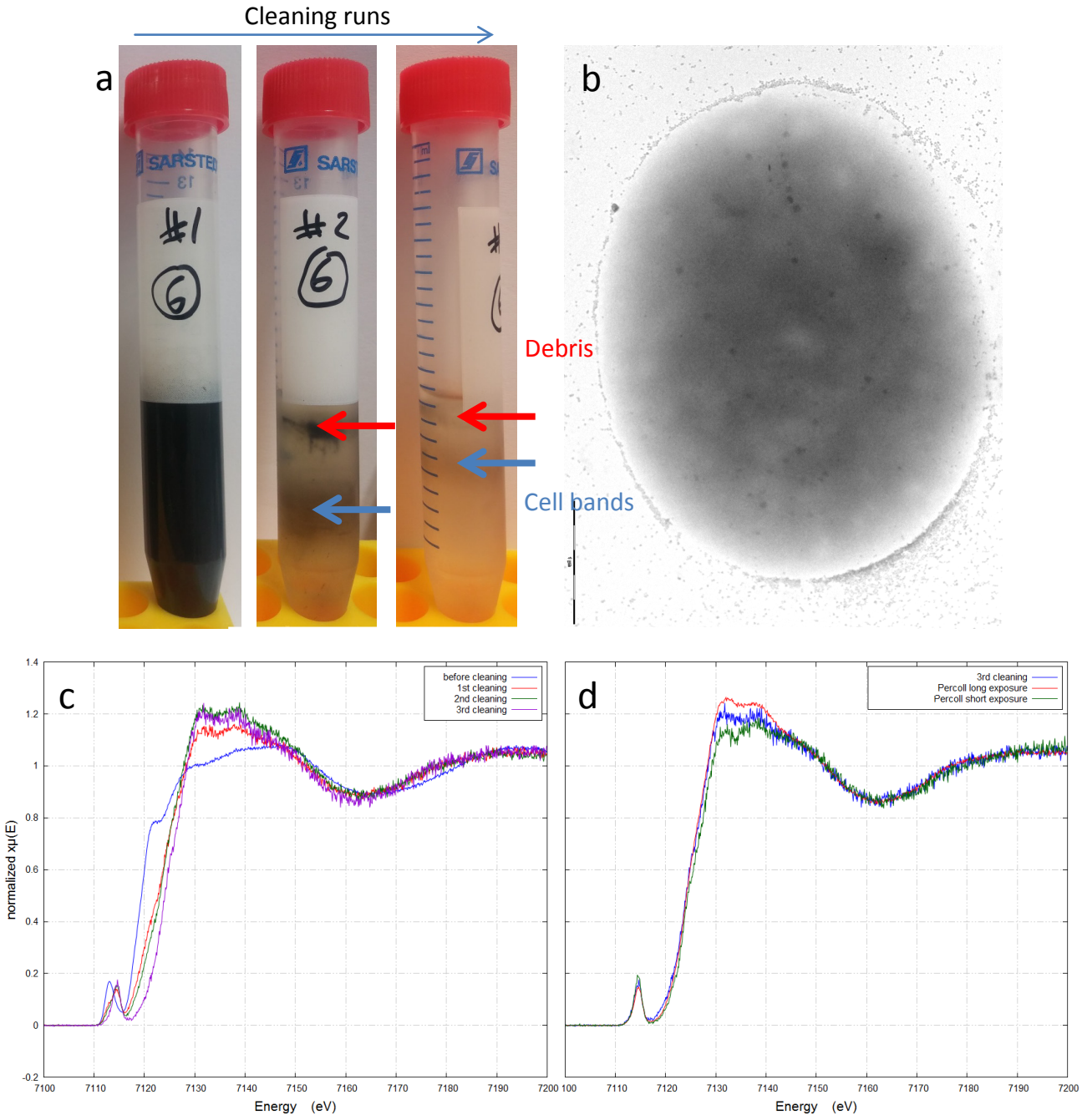
Report:

Magnetotactic bacteria are water microbes that navigate in the geomagnetic field with the aid of intracellular ferrimagnetic nanoparticles. Depending on the species, the nanoparticles are composed either of Fe3O4 or Fe3S4. While the pathway to iron oxide biomineralization is well understood, knowledge about the iron sulfide has been hampered by the lack of available organisms for study. The recently found Ca. D. magnetomortis BW-1 is the only organism that forms both Fe3O4 and Fe3S4 in response to environmental conditions. This provides a unique opportunity to study how the iron sulfide forms and how the bacteria select materials.

Here we report on our Fe K-edge X-ray absorption spectroscopic experiments at ID26 on iron sulfide biomineralization in the magnetotactic bacterial strain Ca. Desulfamplus magneotmortis BW-1 with the aim to identify potential precursor minerals to greigite and magnetite in the bacterium.

SC-4573 is a continuation of a previous beamtime (SC-3917) in which we encountered the problem of extracellularly forming amorphous Fe-S precipitates that mask the intracellulary minerals of interest in Fe K-edge XAS. To separate cells from the extracellular debris, a cleaning method based on isopycnic centrifugation with a colloidal gradient medium was devised and optimized prior to the beamtime and on site (Fig. 1a). Transmission electron microscopy (Fig 1 b) and light microscopy indicate that the cells were successfully cleaned from the amorphous Fe-S debris.



However, Fe K-edge XANES recorded during the beamtime (Fig 1 c and d) revealed that the used commercial colloidal silica gradient medium (Percoll) is unexpectedly contaminated with significnt amounts of iron in the range or above the intracellular levels. Unfortunately, attempts during the beamtime to resolve the issue failed and we aborted the experiment one day before the end of the granted beamtime.