ESRF	**Experiment title:** **How do metals bind to sporopollenin? An EXAFS and XANES study of the binding sites in a naturally occuring, non-toxic bio-polymer with potential as a drug delivery system.**	**Experiment number**: CH-3237
Beamline: BM26A	**Date of experiment**: from: 6/9/2010 to: 9/9/2010	**Date of report**: 25/2/2014
Shifts: 6	**Local contact(s)**: Sergey Nikitenko and Miguel Silveira)	*Received at ESRF:*

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Report:

The ESRF BM26A XANES and EXAFS data were used in conjunction with XRF micro-imaging data from Diamond Light Source to study the binding of iron(II) and iron(III) to the sporopollenin exine capsule surfaces. This work has been published in *J. Mat. Chem. B.,* the citation details and abstract are included overleaf.

How does iron interact with sporopollenin exine capsules? An X-ray absorption study including microfocus XANES and XRF imaging,
S. J. Archibald, S. L. Atkin, W. Bras, A. Diego-Taboada, G. Mackenzie, J. F. W. Mosselmans, S. Nikitenko, P. D. Quinn, M. F. Thomas, and N. A. Young,
J. Mat. Chem. B, 2014, **2**, 945-59. doi: 10.1039/c3tb21523g

Abstract

Sporopollenin exine capsules (SECs) derived from plant spores and pollen grains have been proposed as adsorption, remediation and drug delivery agents. Despite many studies there is scant structural data available. This X-ray absorption investigation represents the first direct structural data on the interaction of metals with SECs and allows elucidation of their structure-property relationships. Fe K-edge XANES and EXAFS data have shown that the iron local environment in SECs (derived from Lycopodium clavatum) reacted with aqueous ferric chloride solutions is similar to that of ferrihydrite (FeOOH) and by implication ferritin. Fe K_α XRF micro-focus experiments show that there is a poor correlation between the iron distribution and the underlying SEC structure indicating that the SEC is coated in the FeOOH material. In contrast, the Fe K_α XRF micro-focus experiments on SECs reacted with aqueous ferrous chloride solutions show that there is a very high correlation between the iron distribution and the SEC structure, indicating a much more specific form of interaction of the iron with the SEC surface functional groups. Fe K-edge XANES and EXAFS data show that the Fe(II) can be easily oxidised to give a structure similar to, but not identical to that in the Fe(III) case, and that even if anaerobic conditions are used there is still partial oxidation to Fe(III).