

## Micro XANES Study on Vanadium in Living Blood Cells of Ascidians by Fluorescence Scanning X-Ray Microscopy at ESRF ID21 Beamline

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Blood cells of ascidians (tunicates) are known to accumulate vanadium selectively from sea water [1]. Several questions have been already addressed and discussed at length: how much is vanadium accumulated? which organ does participate in its accumulation?, and what is the route of accumulation process?. Michibata *et al.*, by using combination of density gradient centrifugation and neutron activation analysis [2], showed that signet ring cells were assigned as true vanadocytes. However, it is not yet known where in the blood cells vanadium is accumulated, and what the accumulation mechanism is.

Micro-XANES is a powerful tool to investigate micro-distribution of chemical species of a given element. Fluorescence scanning X-ray microscope at the ESRF (ID21), covering an energy range from 2 to 7 keV, has the capability of investigating chemistry of vanadium, sulfur, magnesium and calcium. XANES spectra along with fluorescence imaging revealed the spatial distribution and chemical states of vanadium in blood cells derived from two vanadium rich ascidian species (*Phallusia mammillata* and *Ascidia sydneiensis samea*). In particular, used of micro-XRF imaging associated with high pressure cryo-fixation technique demonstrated that vanadium is distributed uniformly in the vacuole of a signet ring cell. Vanadium is selectively accumulated in the intravacuolar granule with a diameter of about 3 micron. Based on pre-edge XANES analysis, vanadium in vacuole and in granule was identified as V(III) and V(IV), respectively. The specific issue of radiation damages on bio-specimens will be also addressed.

### References

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