

CONFOCAL MICRO-XRF/XANES ANALYSIS ON INSECTS TRAPPED IN AMBER

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Synchrotron Radiation induced X-ray fluorescence (SR-XRF) spectroscopy is a non-destructive method for the qualitative and quantitative determination of elements with detection limits down to the sub-ppm level. X-ray absorption spectroscopy (XAS) is a complementary X-ray based technique that allows obtaining information on the local chemical, electronic and structural configuration of a specific element of interest in the sample. Both techniques (XRF and XAS) can be applied in a confocal mode, which is obtained by the mounting of a polycapillary half lens in front of the detector. The collected XRF signal is produced in the intersection defined by the incoming beam and the acceptance of the polycapillary. In this way it is possible to acquire direct information from the specified microscopic volume within a sample body.

In this research, we used both techniques (confocal micro-XRF/XANES) to gather chemical information about insects that are trapped in amber. Amber is a fossilized resin that exuded out of the bark of trees and which is well known for its adhesive properties. Insects trying to gnaw or burrow into the bark get trapped in the tree resin and eventually engulfed by the material. The resin eventually falls to the ground and becomes incorporated into the soil and sediments and, over the course millions of years, it fossilizes into amber. The amber acts as a protective container for the insects and any other organism that it may include, turning it into an interesting subject for further investigations.

Preliminary XRF maps on insects in amber were acquired applying conventional XRF using the high-performance EDAX Eagle-III laboratory X-ray microprobe that is equipped with a polycapillary as X-ray focusing optic. Further, combined micro-XRF/XANES analysis was performed at beamline L of HASYLAB (DESY/Hamburg/Germany) using a confocal set-up based on polycapillary optics in order to gather information on the Fe distribution and speciation within insects that are trapped in amber. Preliminary results of the above described combined analysis will be presented.