ESRF	**Experiment title:** Interaction of sulfur with soil colloids	**Experiment number**: ME-53
Beamline: ID21	**Date of experiment**: from: 18/02/00 to: 21/02/00	**Date of report**: 6/3/00
Shifts: 12	**Local contact(s)**: B. Kaulich, M. Salome, J. Susini	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

Juergen Thieme and Claudia Schmidt
Institut fuer Roentgenphysik
Georg-August Universitaet Goettingen
Geiststr. 11
37073 Goettingen
Germany

Report:

The aim of our experiments with the scanning X-ray microscope at ID 21 is to investigate the variety of sulfur containing components which can occur in soils and how they are attached to soil colloids as clays or quartz.

We started our experiment at the sulfur K-absorption edge with a marsh soil from Northern Germany, because of its high sulfur content. Marsh soils from coastal regions have a higher content of sulfur as other soils, i.e. up to 3% instead of 0.02% to 0.2%. The major source of these components is the microbial activity in these soils. Up to 90% of the sulfur is bound in organic molecules, but also an enrichment of sulfur in the inorganic component sulfide might be possible under anaerobic conditions, if the soil contains a lot of sulfates, which can be reduced by microorganisms. In march soils, the seawater is the source of these sulfates.

Figure 1 shows on the right side an image of a soil colloid in transmission at 2.482 keV. The left image shows the sulfate fluorescence signal of the same sample. It can be clearly seen that the sulfur is distributed inhomogeneously. Afterwards spectra are taken at different regions.

In this soil it was possible to identify spectroscopically amino acids like methionin (2.4737 keV) and cysteine (2.4733 KeV), molecules which built up proteins, and inorganic components like sulfates (2.480 keV) and sulfides (2.470 keV). The spectrum at the bright spot (region 1 in figure 1) indicates that there the dominate sulfur containing component might be cysteine (figure 2 left).

The spectrum from the region 2 on the big colloid shows sulfate and cysteine with similar peak heights (figure 2 right), so here less organic molecules can be found.

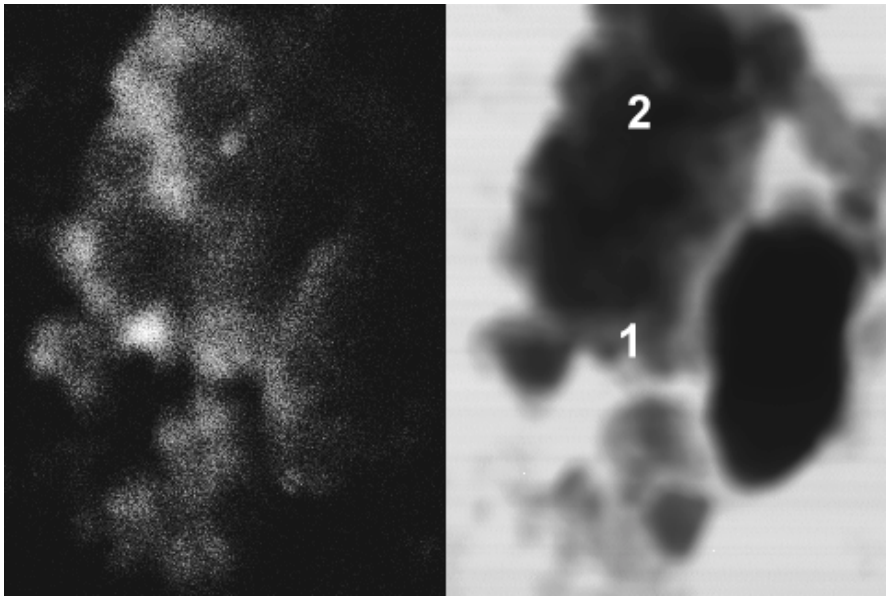

Figure 1. Scanning X-microscope image of a marsh soil at the sulfur K-absorption edge (2.47 keV). Left the fluorescence signal, which indicates sulfur distribution, on the right the transmission image (60x80 µm).

Figure 2: Spectrum from region1 (*left*), cysteine is the dominating su lfur component. Spectrum from region 2