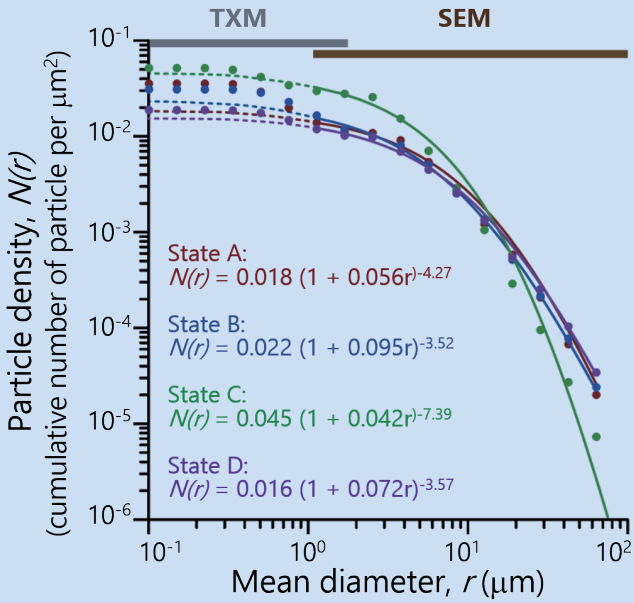

Fig. 2: Distribution of particle size of surviving grains within a melt matrix in four states. [Reproduced from Ref. 5.]

trix. They hence suggested that grain fragmentation during an initial seismic slip affects the melt rheology and transiently increases the fault strength, confirmed with TXM on solidified melts.

In summary, the utilization of a synchrotron TXM improved the understanding of the role of grain fragmentation and its associated products during an initial seismic slip. The additional fragmented grains generated from surface comminution might hamper an initial fault slip by increasing the viscosity of the frictional melt. Most importantly, this fault-strengthening behavior becomes noticeable at smaller depths, which demonstrates that pseudotachylytes might not always be an indication of fault lubrication (Reported by Li-Wei Kuo, National Central University, and Chun-Chieh Wang).

*This report features the work of Li-Wei Kuo and his collaborators published in J. Geophys. Res. Solid Earth **124**, 11150 (2019).*

TLS 01B1 SWLS – X-ray Microscope

- TXM
- Geosciences

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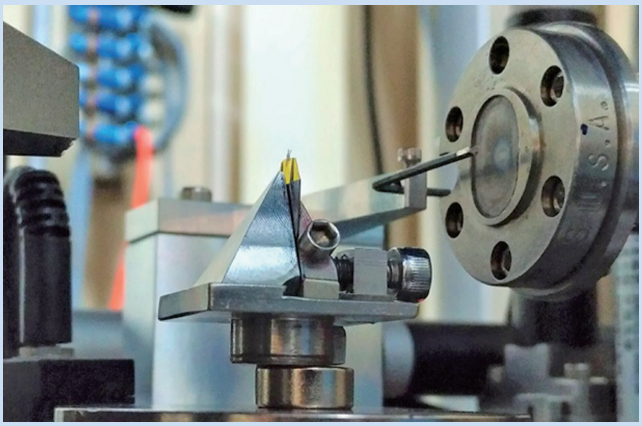

TLS 01B1 SWLS – X-ray Microscope.

What Is to be Expected in a Contaminated Area?

When an agricultural area is located in the vicinity of a steel factory, the nature of arsenic retention by soil must be identified.

Several metals and metalloids are physiologically essential for living organisms as trace elements (TE), but, when present in excessive concentrations, they might have harmful effects for human beings, animals, plants and microorganisms. In most cases, high soil levels of TE derive from particular industrial activities; industrial areas are hence commonly known for their high level of contamination. These areas are typically contaminated with multiple elements, some of which are insufficiently monitored, because they contain elements that are rarely studied. Such elements include V, Mo, Se, Ag, Sn, Sb and Tl, whereas other elements such as As, Cd, Co, Cr, Cu, Fe, Mn, Ni, Pb and Zn are more often studied. In Greece, there are a few known contaminated areas, located mainly around former mining exploration

sites and in industrial areas of main cities, but there are some areas that are suspected to be contaminated but that have never been investigated. One such area is the industrial area of Volos (IAV); this area has the unique features of being (a) used continuously for centuries for the production of food crops, mainly wheat and maize, and (b) in the vicinity of various activities that would result in TE enrichment. Because pertinent understanding is lacking, little is known about the dynamics of TE in soil and the associated risks for human health in such under-explored areas.

Vasileios Antoniadis (University of Thessaly, Greece), with the collaboration of Jörg Rinklebe and Sabry M. Shaheen (University of Wuppertal, Germany), Shan-Li Wang (National Taiwan University) and Yu-Ting Liu (National Chung Hsing University), assessed the risks to human health related to the pseudo-total and potentially available TE in soils and cultivated maize in the agricultural area adjacent to the IAV.[1] For this purpose, the use of XANES at **TLS 17C** was an important tool for the identification of the nature of arsenic (As) retention in the tested soils because it is a highly enriched element in the studied area.

Two soils with the greatest levels of As (sample #3, 216 mg kg^{-1}; sample #16: 179 mg kg^{-1}) were selected for XANES analysis at **TLS 17C** to identify the predominant mineralogical association of As in the soils. The results revealed that in both samples Fe (hydr)oxides (*e.g.*, ferrihydrite) were the predominant soil mineral in association with As; normalized values for As(V) attributed 87.3% of this species to ferrihydrite in sample #3 (**Fig. 1**); the remaining 12.7% was attributed to the much more toxic As(III) species (*R*-factor 0.0031324, **Fig. 2**). Similarly, in sample #16, 82.3% of As was attributed to As(V) and 17.7% to As(III), both related to Fe (hydr)oxides (*R*-factor 0.0021428).

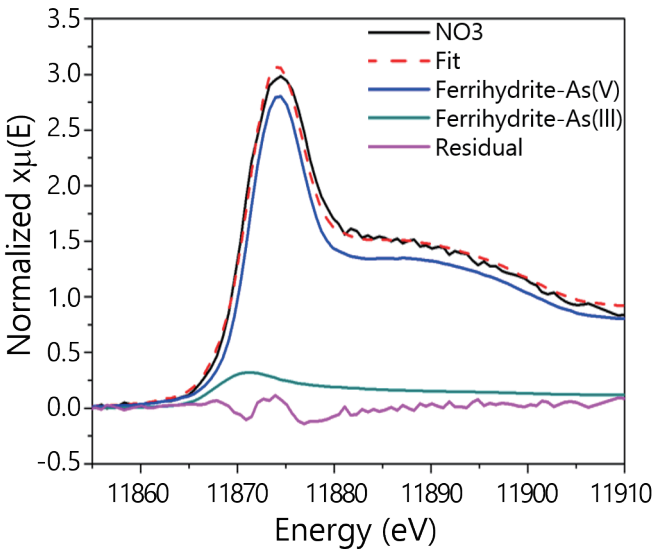

Fig. 1: XANES spectra of As in sample #3 of the industrial area of Volos, Greece. [reproduced from Ref 1]

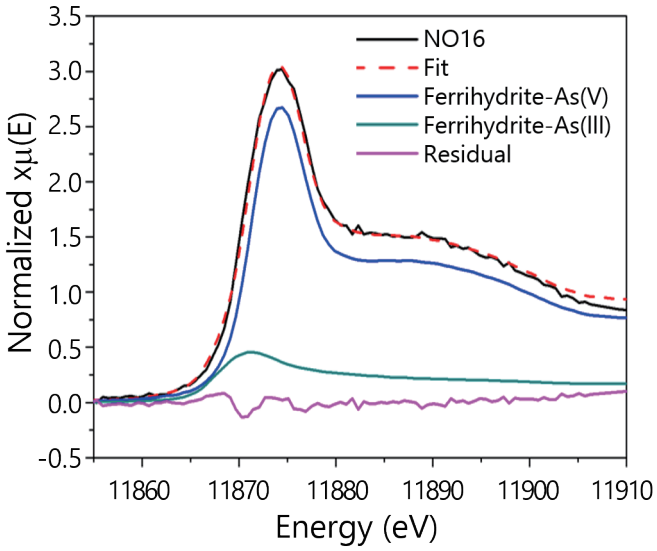

Fig. 2: XANES spectra of As in sample #16 of the industrial area of Volos, Greece. [reproduced from Ref 1]

This agricultural field under investigation is adjacent to the industrial area of Volos, Greece. The soils were extremely enriched with thallium (Tl), a highly toxic metal. Along with Tl, the soils contained As in large concentrations. The XANES spectra of these soils have provided information to bring insight into the nature of As retention by soil constituents. This novel study can pave the way and create urgent future means for monitoring other areas in the world with similar characteristics of trace-element contamination. (Reported by Shan-Li Wang, National Taiwan University)

This report features the work of Jörg Rinklebe and his collaborators published in Environ. Int. ***124****, 79 (2019).*

TLS 17C1 W200 – EXAFS

- XAS
- Environmental Sciences

Reference

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