



**Martin Luther Universität Halle-Wittenberg**  
**Institut für Geowissenschaften**  
**Mineralogie/Geochemie**  
Prof. Dr. Dr. H. Pöllmann  
von-Seckendorff-Platz 3, 06120 Halle,  
Tel: +49.345.5526111, Fax: +49.345.5527180,  
e-mail: herbert.poellmann@geo.uni-halle.de



## Immobilisation of Hazardous Substances from Tailings using Mineral Reservoir Technology: Case Study of Tailings from Ghana

F. Y. Amoako & H. Pöllmann & W. Gossel

Martin-Luther-Universität Halle-Wittenberg, Fachbereich Geowissenschaften, AG Mineralogie/Geochemie & Umweltgeologie

[felix.yebo-amoako@student.uni-halle.de](mailto:felix.yebo-amoako@student.uni-halle.de)  
[herbert.poellmann@geo.uni-halle.de](mailto:herbert.poellmann@geo.uni-halle.de)  
[wolfgang.gossel@geo.uni-halle.de](mailto:wolfgang.gossel@geo.uni-halle.de)

The chemical stability of tailings from mineral processing is an important study for investigation of impacts on the environment, especially ground water pollution and acid mine drainage (AMD). Subject of the investigation presented here are the tailings of gold mines in Ghana. In general, there is possibly a difference in the chemical behaviour or stability of tailings from sulphide ores and lateritic ores respectively. Results of investigation on water collected from piezometers and observation boreholes around the tailing dam show different chemical leaching behaviour. The chemical investigation of the tailings sediment is the topic of the ongoing work. The aim of this work is the interpretation of results obtained from chemical and mineralogical analyses of tailings (liquid and solids contents) and the development of a technique for the immobilisation of the hazardous substances in mineral reservoirs.



Fig. 1.0: Aerial view of North Embankment of TSF, Sansu AGA, Obuasi

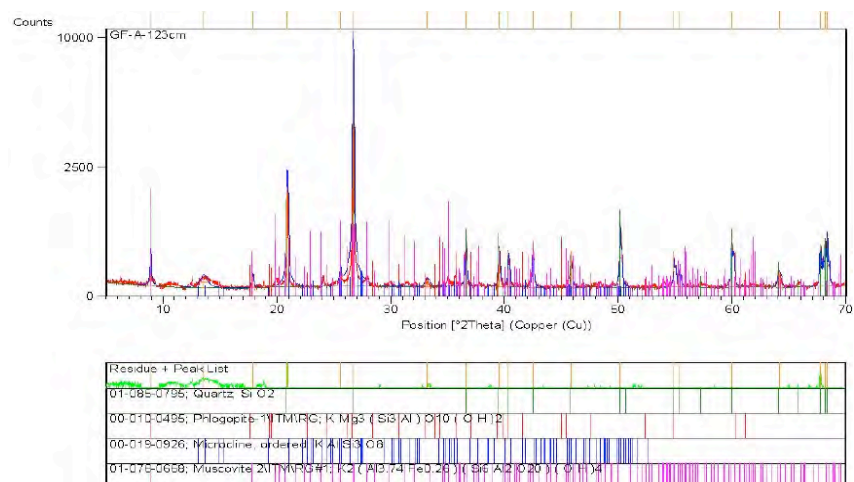


Fig. 2.0: XRD Diffractogram of Tailings sample for GFGL, Tarkwa. Major minerals identified include: Quartz, phlogopite and muscovite (mica), and microcline (triclinic)

The work investigates the chemical state of the material and water from the surface to a required depth at the tailings dam. The water samples from piezometers from the tailings give a description of the leaching front. These samples are investigated for the main components and metal speciation using IC and ICP-OES respectively. The results from the measurement will be modelled with PHREEQC to determine redox conditions of formation, solution and precipitation of hazardous compounds. The investigations to be conducted on solid sediments include:

- Chemical and mineral phase analyses with XRD, XRF and SEM (EDX)
- Investigation of the leachability of heavy metals from tailings sediment using "pH-Stat Method", ICP-OES and IC
- Investigation of particle size distribution using granulometry or sieve method

The results obtained from the investigation are interpreted. Based on the outcome, a technique for immobilisation of hazardous substances using mineral reservoir technology is developed in relation to results of former work (Lottermoser 2003 and Poellmann 2007).

### LITERATURE

Lottermoser, B.G.: Mine Wastes - Characterization, Treatment and Environmental Impacts. Springer-Verlag Berlin Heidelberg, (2003)  
Poellman, H.: Immobilisierung von Schadstoffen durch Speichermineralbildung. Berichte aus der Geowissenschaft, Shaker-Verlag Aachen, (2007)