

# Geochemical characteristics of suspended matters and sediments in a small watershed of the central Guizhou province and its weathering implications

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Southwest China is one of the three biggest karst areas in the world. Over the past few decades, land use changes in this area have resulted in a series of severe ecological and environmental problems. This paper presents data on trace elements and C, N isotopes of suspended matters and sediments collected from the Qianzhong watershed in the central Guizhou province, Southwest China. Results showed that the contents of trace elements are different between rivers and lakes, also between suspended and sedimentary phases; the spatial and temporal distribution of OC contents,  $C_{\text{organic}}/N_{\text{total}}$  and  $\delta^{13}\text{C}$  in total suspended matter (TSM) and sedimentary matter showed different variation, indicating the transfer and arrival of allochthonous organic matter and the ecosystem changes during past sedimentary period.  $\delta^{15}\text{N}$  ratios reflected the combined results of information of sources and a series of biogeochemical processes. Although  $\delta^{15}\text{N}$  ratios could provide limited information of sources, it can be used to trace some special biogeochemical processes. The conclusion was testified the element characteristics and material conveying status in chemical weathering and physical erosion processes in the small watershed. And by the analysis of end members.  $\text{C}_3$  plant debris and soil organic matter from decomposition of a mixture of  $\text{C}_3$  and  $\text{C}_4$  plant debris are the dominant sources for SED-OC, and aquatic plants for POC. The fractionation of  $\delta^{13}\text{C}$  caused by decomposition of organic matter or diagenesis was minor. There are two models for the relationship between physical erosion and chemical weathering there: the co-promotion model for regions which have serious anthropogenic effects, and the increase and decrease model for regions where anthropogenic input is less significant. Both models would likely to be occurring in global scale.

# From schwertmannite to natrojarosite: aging processes involving precipitation and dissolution reactions

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## Introduction

Minerals of the jarosite group ( $M\text{Fe}_3(\text{SO}_4)_2(\text{OH})_6$ ) are involved in different mineralogical and geochemical processes occurring in the environment (acid mine water drainage, chemical weathering). Here, the objective is studying the genesis of natrojarosite during aging processes at ambient temperature. For this purpose, a set of experiments was carried out by mixing  $\text{Fe}_3(\text{SO}_4)_2$  (0.5N) and NaOH (0.5N) parent solutions which were kept at constant agitation for specific reaction periods (1 hour to 50 days). Similar experiments were performed using 1N concentration of parent solutions. Composition and crystallinity were determined by X-ray powder diffraction (XRD) using the computer program X'Pert Plus (Panalytical). The aqueous solution composition was analysed by ICP-OES, and the pH was monitored at the beginning and end of the experiments. Speciation and aqueous solution modeling was carried out using PHREEQC code [1].

## Results and Conclusion

XRD results reveal that schwertmannite ( $\text{Fe}_8\text{O}_8(\text{SO}_4)(\text{OH})_6$ ) precipitate in the early stages of the experiments, regardless of the initial concentration. In the case of the experiments carried out with 0.5 N parent solutions, schwertmannite remains during the entire aging process. In contrast, using 1N parent solutions, schwertmannite evolved to form natrojarosite ( $\text{NaFe}_3(\text{SO}_4)_2(\text{OH})_6$ ). The main XRD reflections (012, 021 and 113) of natrojarosite become more apparent and undergo a progressive decrease of widthness (FWHM) and an increase of intensity which indicate an increasing degree of crystallinity at the end of the aging process. The analysis of the aqueous solution shows that there is a virtually complete removal of Fe due to the precipitation of schwertmannite. In the experiments performed with 1N parent solution, the evolution of the aqueous composition is consistent with the initial precipitation of schwertmannite and subsequently, the precipitation of natrojarosite with increasing of crystallinity. The reactions takes place in acidic conditions (pH~2.2) in all experiments. Although PHREEQC considers many other phases susceptible to precipitate, any of these were identified in the diffractograms.

A set of reactions, including precipitation of schwertmannite and its transformation into natrojarosite takes place simultaneous in a highly supersaturated aqueous medium for both phases.

[1] Parkhurst and Appelo (2000), US Geological Survey Water-

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