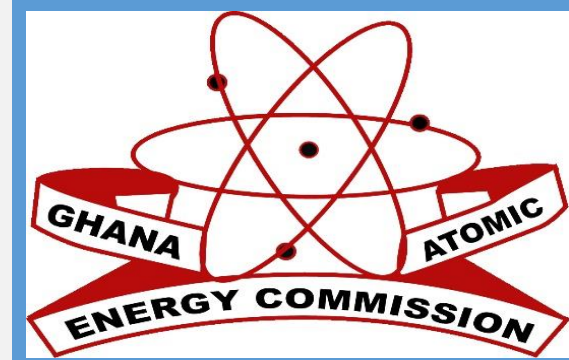


THE USE OF LEACHING EXPERIMENTS TO EVALUATE ROCK-WATER INTERACTIONS WHICH INFLUENCE GROUNDWATER CHEMISTRY IN THE NORTH-WESTERN PART OF THE VOLTA RIVER BASIN OF GHANA; PRELIMINARY RESULTS.



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STUDY AREA

The study area is in the Upper West Region of Ghana-Africa. In terms of Climate, the area is semi-arid with short, single rainy season and extended period of dry. Geologically, the area is underlain by Precambrian Crystalline Rocks (Igneous and metamorphic rocks).

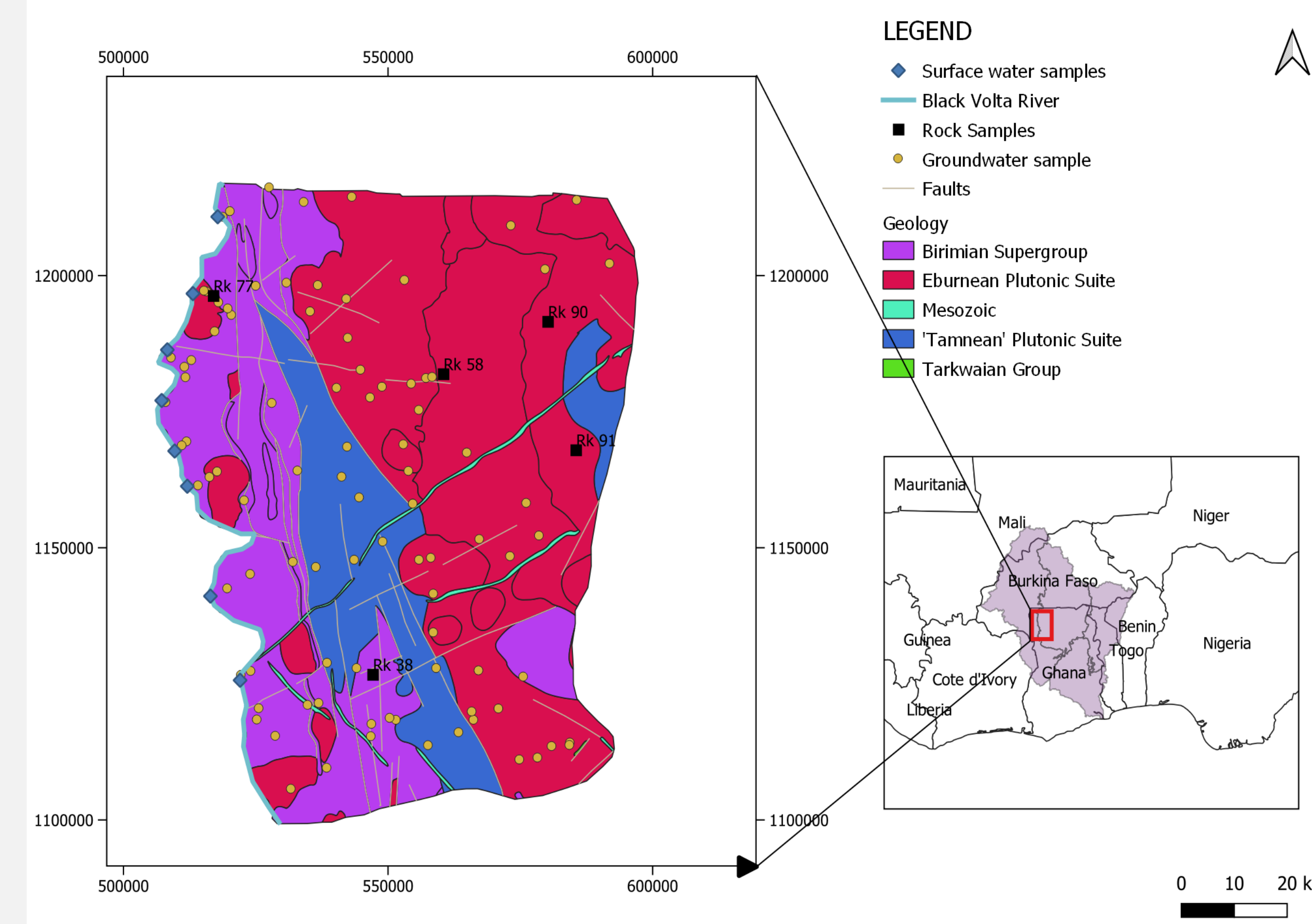


Fig 1. Geology map of study area

MATERIALS AND METHODS



Five silicate rocks representative of aquifers hosting groundwater in the area were sampled.

Rocks were labelled **RK 90, RK 38, RK 91, RK 77 and RK 58** after its proximity to sampled groundwater

- Thin sections were first developed from each rock sample
- Samples were then crushed and a portion used for XRF and XRD analyses
- A portion of each crushed rocks was then used for the experiments with **rock: water ratio of 1:10**
- Five experimental conditions were considered; **Room temperature, 50°C, CO₂ and a mixture of HNO₃ and H₂SO₄**
- To study the reaction progress, Electrical Conductivity (EC) and pH were measured at regular intervals while aliquot of the leachates were sampled every two months for major ion and silica analyses

INTRODUCTION

The chemical composition of groundwater is derived from multiple sources, especially rock – water interactions. These activities along flow paths determine the final composition of groundwater, for which its quality is important for end users. It's especially the case in rural areas in the North-Western part of the Volta River Basin of Ghana, where the indigenes can hardly afford treated tap water. Although studies have been carried out to study the geological processes responsible for groundwater chemistry, none have attempted studying the results of rock – water interactions under controlled conditions (leaching experiments) which provides an elaborate means of understanding the geological processes responsible for groundwater chemistry.

In this study, leaching experiments were carried out on five silicate rocks from the study area under different experimental conditions.

The objective is to perform geochemical modelling on results of the leaching experiments to explain geological processes responsible for groundwater chemistry in the study area.

REFERENCES:

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RESULTS

IDENTIFICATION OF MINERAL PHASES

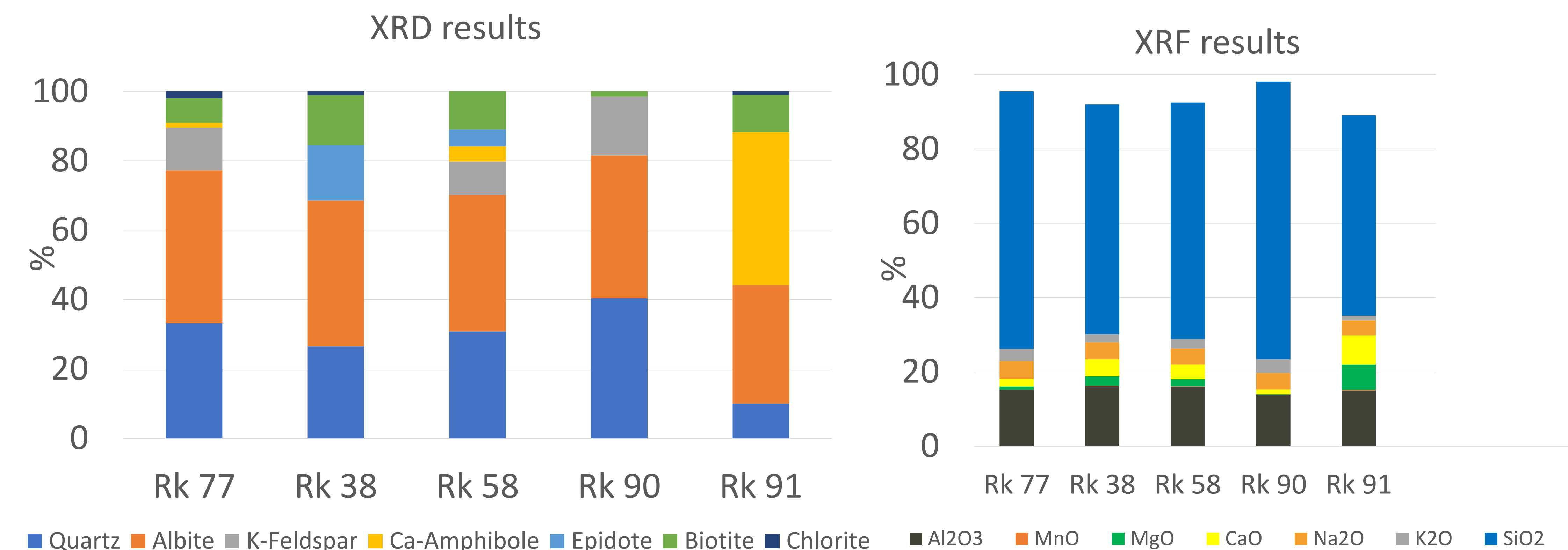


Fig. 2. XRD and XRF results of Rock Samples used for the leaching experiment

REACTION PROGRESS OF LEACHING EXPERIMENT

Stiff diagrams of major ions plotted from results of all experiments, illustrate that leachates of each rock type produced various concentrations of water types depending on the mineral composition of rocks and experimental condition. Temperature did not have much influence on leachates because high temperatures reduces CO₂.

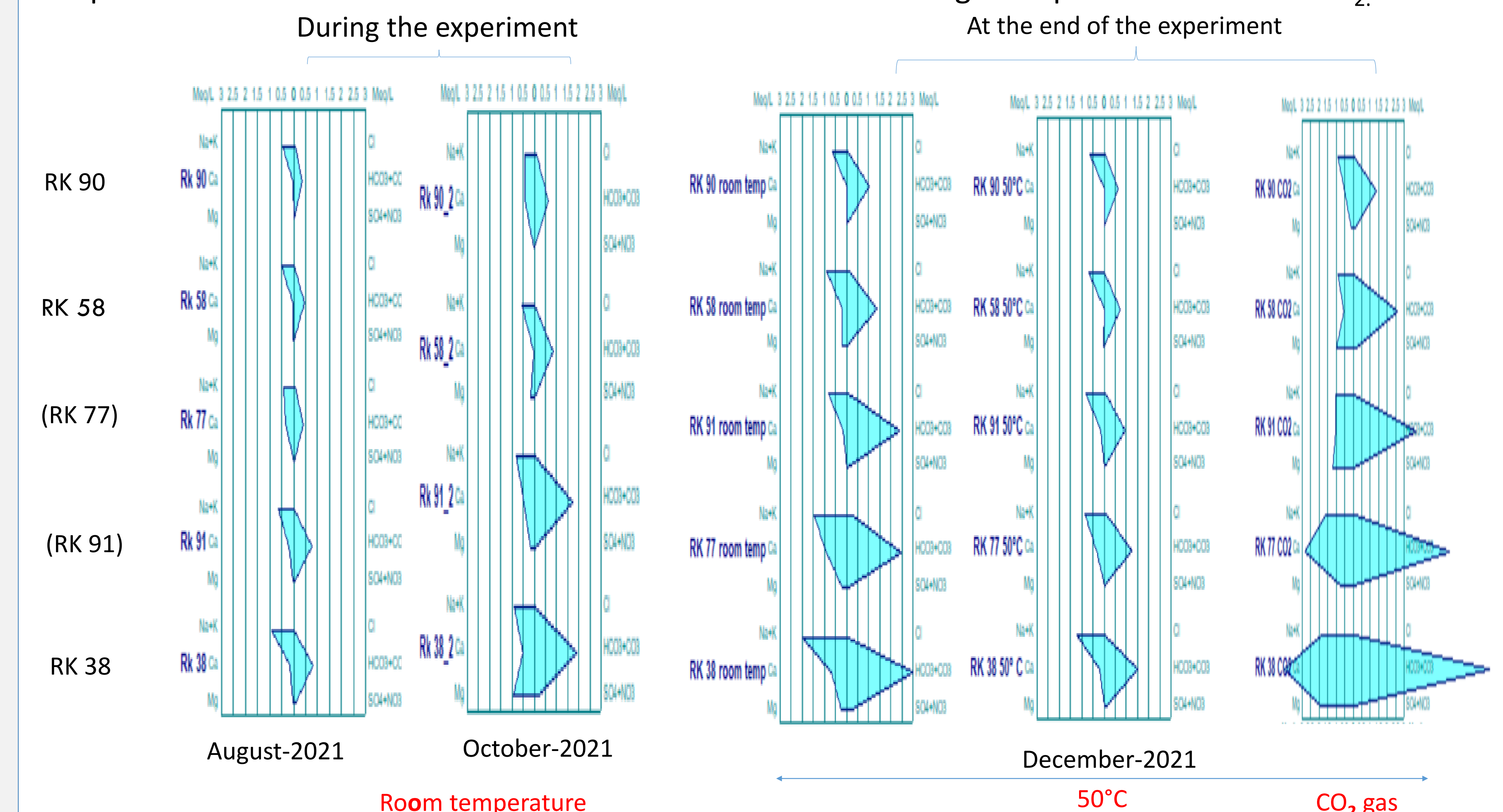


Fig 3. Stiff diagrams representing the evolution of major ion chemistry of leachates from the various rock types under different experimental conditions.

CONCLUSION: Minerals phases identified under thin sections and XRD suggest that the rock types are granodioritic in composition. Higher percentages of SiO₂ and Al₂O₃ reported by XRF indicate that rocks contain more aluminosilicate minerals. Water types Preliminary results from leaching experiments corroborates that the dissolution of minerals in groundwater is dependent on the minerals contained in the rocks, reaction time and the presence of CO₂.