A combined LA-ICP-MS and DEGAS study on Bediasites and Ivory Coast tektites

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Impacts processes yield different types of mineral and rock melts which after cooling/quenching occur as “impact glass” in different geological settings in, around, and far off an impact crater. To the latter group belong the tektites whose formation process is still not well constrained despite intense geochemical studies [1] and modeling attempts [2].

We have analyzed two Ivory Coast (IVC) tektites (source crater Lake Bosumtwi, Ghana) and three Bediasites (North American tektite strewn field, related to the Chesapeake Bay structure, Virginia). Electron microprobe (5 µm defoc. beam) major element, and LA-ICP-MS trace element analyses (spot diameter 60 µm) point to a remarkable homogeneity of the tektites, internally as well as the whole group. Any hint of a diffusive loss of certain elements (i.e., the more volatile ones) is absent. The glasses are exceptionally dry: DEGAS analysis yield an H_2O content of 20-30 ppm for Bediasites which contain in addition traces of CO. The IVC tektites are likewise extremely depleted in gases, they contain ~100 ppm H_2O, and traces of CO_2 and CO with $CO/CO_2 > 1$.

The presence of reduced species (CO, total lack of ferric iron), and the extremely low volatile content foster the conclusion that material now forming tektites must have experienced flash heating at extreme temperatures under highly reducing conditions followed by fast quenching. The chemical homogeneity probably reflect more the melt/ejection process than homogeneity of the precursor materials.

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Using a mechanistic adsorption model to understand the influence of soil pH on the environmental availability of Phosphorus: Application to a Chromic Cambisol

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Geochemical processes, particularly adsorption/ desorption, which control inorganic phosphorus (P) soil availability were affected by plant rhizospheric functions. In this study, we intended to characterize the influence of pH variations which occurred in rhizosphere on process controlling P availability. We used an approach combining chemical extractions and geochemical modelling to study the speciation of P in Mediterranean chromic cambisol soils. First, one dataset where soil pH was adjusted manually ranging from acidic to alkaline conditions (pH ≈ 3 to 10) were used. In second, three sub-samples were chosen and soil pH was modified by wheat growth with NO_3^- applications. All the samples were analysed with $CaCl_2$ extractions which is equivalent of aqueous P. We used the CD-MUSIC model in attempt to simulate P sorption based on $CaCl_2$ extracts.

For the first dataset, the fit between simulated and measured P-$CaCl_2$ was quite good ($R^2 = 0.80$ and RMSE = 0.034 mg kg^{-1}). This suggest that P available was controlled by sorption process in the soils studied [1]. The adsorption capacity of minerals and P surface complexes, both explained P-$CaCl_2$ variations as a function of pH. Modelling of the second dataset showed us that the increase of P-$CaCl_2$ in soils with plants was not fully explained by pH, we also need to consider citrate exudation. This model must be validated on other P-deficient soils.

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