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Surface altered layers as a signature of chemical weathering: a review of inorganic and microbially-mediated processes on minerals and glasses.

ROLAND HELLMANN

ISTerre, CNRS

Presenting Author: roland.hellmann@univ-grenoble-alpes.fr

In this talk I will review the formation of surface altered layers (SALs) on both minerals and glasses. SALs are ubiquitous features that form on mineral[1] and glass[2] surfaces during aqueous chemical weathering. This makes them excellent nm- to µm-scale signatures that testify to the reactive presence of aqueous fluids. SALs can form due to inorganic processes, but can just as well be due to the action of microbes and other organisms (e.g. biologically mediated basaltic glass alteration in seawater[3]). The thermodynamic driving force that leads to their formation is a chemical state of non-equilibrium between the solid and contacting fluid. This results in a separate phase forming in situ at the near surface, such that SALs have both a distinct atomic-scale structure and chemical composition that are different from the parent material. Their *in situ* formation mechanism is a key characteristic that differentiates SALs from classical secondary precipitates that can form from a chemically oversaturated bulk solution. Moreover, they are also often characterized by high porosity. SALs are dynamic features, as they will reflect temporal changes in the nature of the aqueous fluids. One of the key fluid parameters associated with their formation is the fluid pH. It has been commonly assumed that SALs are mostly prevalent at acid pH conditions, very thin at neutral pH, and practically non-existent at basic pH. However, recent research has shown that they can also form at very basic pH conditions[4,5].

References:

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