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Tracing lateritic soil genesis through defects and impurities in kaolinite

Traçage de la genèse des sols latéritiques au travers de défauts et impuretés de la kaolinite

ALLARD Thierry [1], BALAN Etienne [1], DJEMAI Ahmid [2], MORIN Guillaume [1], MULLER Jean-Pierre [1,2]

[1] Laboratoire de Minéralogie-Cristallographie, Universités de Paris 6 et 7, UA CNRS 09 and IPGP, 4, Place Jussieu, 75252 Paris Cedex 05, France
[2] ORSTOM, UR 12 "Geosciences de l'Environnement Tropical", Centre ORSTOM d'Ile de France, 32 Avenue Varagnat, 93143 Bondy Cedex, France

Recent developments in chemically-specific spectroscopic methods allow detailed discussion of the location of elements in clay minerals. They provide clues about conditions of formation and evolution of materials at the Earth's surface [1]. On account of their high sensitivity, spectroscopies such as Electron Paramagnetic Resonance (EPR) and second derivative Diffuse Reflectance Spectroscopy (SRD) allow (i) detection and analysis of very low contents of various defects and impurities trapped within natural kaolinite particles [2] and (ii) a precise identification of the associated Fe-oxides, which form coatings or inclusions [3]. The objective of this study is to demonstrate that EPR and DRS investigations of kaolinites and associated Fe-oxides provide a basis for an interpretation of the formation of lateritic soils.

Samples came from vertical sequences cross-cuting a latosol differentiated at the expense of sedimentary kaolins (Manaus, Brazil) and a soft pebbly laterite derived from a granito-gneiss substrate (Cameroon).

The spectroscopic signatures of soil materials (i) are efficient fingerprints for deciphering successive generations of kaolinites in each of the profiles investigated and, (ii) on account on their sensitivity to geochemical changes, help to clarify the relationship between soil horizons, and hence the differentiation of lateritic profiles. This spectroscopic investigation shows that profiles presenting similar organization could result from slightly different histories.

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