

EVIDENCE OF Cu IN OCTAHEDRAL LAYERS OF NATURAL AND SYNTHETIC KAOLINITES

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Different kaolinites which occur in the top part of lateritic weathering profiles, present, after a very effective de Endredy deferration treatment, chemical analysis with 1000 to 1500 ppm Cu. The sample 192 is a kaolinite formed on Cu-mineralized felsic volcanics from Burkina Faso (West Africa), the samples PA2 and PA3 are kaolinites formed on Cu mineralized micaschists from Chapada-Grande, located about 250 km NW from Brasília (Brazil).

XRD analyses and electron microscope observations of the sample 192 (0.2-0.5 μm fraction) and the samples PA2 and PA3 (< 0.2 μm fraction) reveal a little irremovable mica in amounts which do not exceed 5 %.

Copper kaolinites have been hydrothermally synthesized (250°, 7 days). At the end of synthesis only kaolinite is detected in the solid phase, with a bulk CuO content as high as 1%.

Chemical analyses performed on the kaolinite particles of all the studied samples, with an Energy Dispersive Analyser coupled with a Transmission Electron microscope, showed the presence of Cu in statistical amounts near those given by the chemical analyses performed on the whole sample.

The problem of the actual location of copper and its relation with the crystallographical structure of kaolinite is then posed.

McLaren and Crawford (1) gave a value of 120 ppm as a maximum for surface adsorbed Cu on kaolinites. The natural and synthetic kaolinites here studied present respectively ten and one hundred times more Cu than these values. The work

presented here makes use of ESR (Electron Spin Resonance) spectrometry to get informations concerning the location of Cu. In a previous work, made on Cu-smectites, the authors differentiate Cu in the octahedral sheet from that in the exchangeable position in the interlayers (2). A shift for the g - ESR signal was observed between air dried (g = 2.055) and more than 48 hours water soaked smectites (g = 2.132) when Cu is in an exchangeable position. No shift, or at least a little shift in the opposite sens, was observed for smectites whose Cu is located in the octahedral position (g = 2.05 for the air dried samples and g = 2.02 for the 48 hours water soaked samples).

In the work presented here we compare Cu(II) ESR spectra of the deferrated natural kaolinites with those of the synthetic kaolinite.

The ESR signals observed for the natural and synthetic Cu kaolinites present the same behaviour between air dried (g = 2.04) and 48 hours water soaked samples (g = 2.03) than those observed by the authors for Cu in octahedral position of smectites. We have to mention also that the shape of the ESR signal of our studied kaolinites is like the one of a magnetically diluted Cu(II) signal and not like the one of copper in phases having a high Cu-content like chrysocolla which presents a large isotropic signal at g near 2.

All the analysis performed on the natural and synthetic material are in good accordance with a location of Cu(II) in the octahedral layer of these kaolinites.

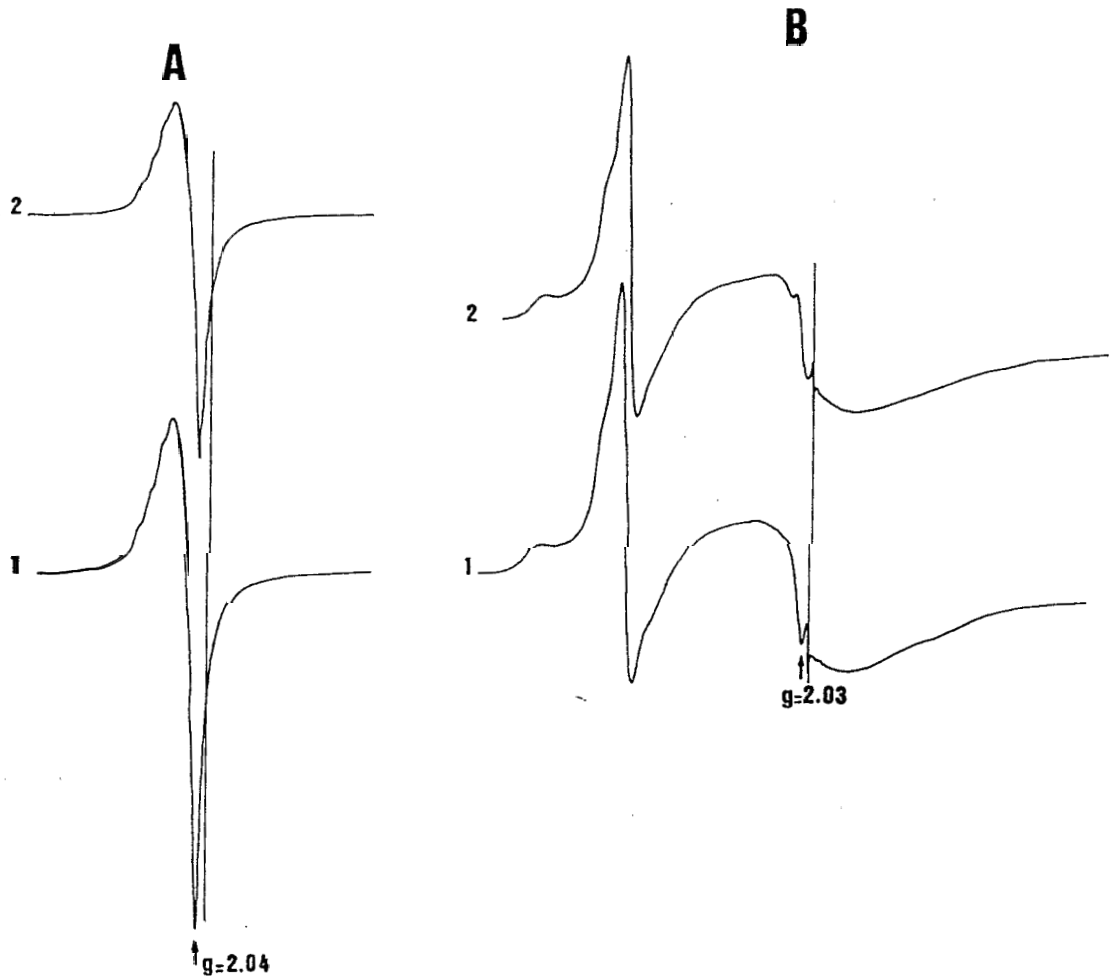


Fig. 1 : ESR Spectra of synthetic kaolinite (A) and sample PA3 (B). 1 = dry samples; 2 = water soaked samples.

REFERENCES

(1) McLAREN R.C. and CRAWFORD D.W. (1973). Studies on soil Copper II. The specific adsorption of copper by soils. *J. Soil Sci.*, 24, p. 443-452.

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