STUDY OF SURFACES OF PHYLLOSILICATES AND THEIR INTERACTION WITH DNA/NUCLEOTIDES VIA HIGH SPATIAL RESOLUTION SYNCROTRON RADIATION LIGHT

This study is focused on clinochlore crystal chemistry and on its surface interactions with biomolecules. Clinochlore, which is a chlorite, is formed by two different polyhedral units: (i) two tetrahedral sheets (T) sandwiching a Mg-rich octahedral sheet (O) and (ii) an octahedral Mg-, Al-rich, brucite-like, interlayer (B). The excess of negative charge of the TOT layer is neutralized by the positively charged B interlayer. Extensive hydrogen bonding provides structural cohesion between the TOT layer and the B interlayer.

The clinochlore studied is triclinic IIb-4 polytype, with symmetry $C\bar{1}$ and unit cell parameters a = 5.3301(4) b = 9.2511(6) c = 14.348(1) (Å) α = 90.42(1) β = 97.51(1) γ = 90.00(2) (°). The chemical composition is $^{[VI]}(Mg_{9.6}Fe^{2+}_{0.27}Al_{2.01}Cr_{0.09})^{[IV]}(Si_{5.86}Al_{2.14})O_{20}(OH)_{16}$.

AFM (Atomic Force Microscopy) and EFM (Electric Force Microscopy) studies suggest that clinochlore presents, at the nanoscale, negative regions of exposed oxygens (tetrahedral sheets, lower layer) and positive regions of exposed hydroxyl groups belonging to the brucite-like which is about 0.5 nm thick; the brucite-like layer is more effective in assembling the biological molecules rather than the exposed oxygen surface.

Measurements of surface reflectivity carried out at ESRF at SpLine (BM25B, Spanish Beam Line), suggest that biological molecules, such as nucleotides, can be adsorbed as (001) organized layer on the mineral surface as showed in Figure 1.

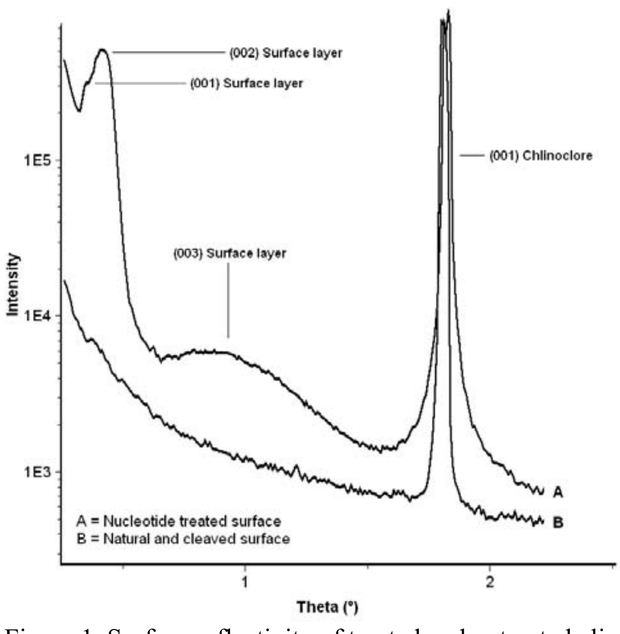

Figure 1. Surface reflectivity of treated and untreated clinochlore