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Surface chemical characterization and surface diffraction effects of real margarite (001): An angle-resolved XPS investigation

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ABSTRACT

The (001) surface of natural pure margarite was chemically characterized by angle-resolved X-ray photoelectron spectroscopy (ARXPS). The extreme surface sensitivity of ARXPS permits concluding that the chemical composition of the near-surface region differs from the bulk because of the strong anisotropy of the margarite structure. Depth profiling was carried out by angle resolved spectroscopy that is a non destructive measuring technique. More grazing polar angles sample increasingly superficial layers of the margarite. The topmost layers are made up of C, due to the mineral/atmosphere interaction. At low grazing angles the concentration of Si increases, and both Al and Ca decreases; therefore we conclude that the tetrahedral sheet is the topmost monolayer. Repulsion between the octahedral and tetrahedral sheets is probably responsible for the cleavage. Photoelectron diffraction effects are also clearly evidenced by Si, Ca, and Al. Single-scattering cluster calculations were performed in simulating scanned angle core emission. The calculated patterns do not show a reasonable agreement with experimental data.