# Origin of the Rio Capim Kaolin with basis on optical (petrographic and SEM) data

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## Abstract

The Ipixuna Formation (Late Cretaceous-?Early Tertiary) exposed in the Rio Capim area, northern Brazil, was subdivided recently into three stratigraphic horizons, informally known as the lower soft kaolin unit, the intermediate kaolin unit, and the upper, endured, semi-flint kaolin unit. These units had their primary texture and composition strongly modified after deposition. Petrographic and scanning electronic microscopic (SEM) investigation revealed many remaining features that allow distinguishing the soft and the semi-flint kaolin deposits into two depositional sequences. The soft kaolin unit consists of well structured, sub-angular to sub-rounded, and locally angular, kaolinitized quartzose sandstones and kaolinitized sandstones that are interbedded with either laminated or massive pelites. These lithologies, composed by grains and lithic fragments related to felsic volcanic and meta-volcanic sources, as well as metamorphic and granitic rocks, had their texture and composition strongly modified, mostly likely during diagenesis, resulting deposits with an actual wacky nature. Kaolinitization produced three types of kaolinites, categorized according to size and texture, as Ka, Kb and Kc kaolinites. Ka kaolinite, typical of the sandstones, consists of hexagonal to pseudohexagonal crystals 10-30 μm in diameter, and occurs as agglomerates of booklets or vermicular crystals that reach up to 400 μm in length. Kb kaolinite, which dominates in the mudstones, consists chiefly of hexagonal and pseudohexagonal crystals averaging 1-3 μm in diameter that occur isolated, or as intergrowths of chaotic, face-to face or, less commonly, parallel to pseudo-parallel crystals. Kc kaolinite, which is

abundant only in association with paleosols, displays hexagonal to pseudohexagonal crystals with regular sizes around 200 nm in diameter. The semi-flint is attributed to a distinctive depositional unit formed by sediments from variable sources, but with a significant contribution from the underlying soft kaolin. This is suggested by a high volume of sandstones displaying grains that are sub-rounded to rounded and consisting of homogeneous, dark brown masses of kaolinite that are strongly highlighted by films of iron oxides. As opposed to the soft kaolin unit, the semi-flint is dominated by endured Kc kaolinite, which mostly likely results from combination of weathering during transportation and pedogenesis acting in several phases of sediment subaerial exposure.