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Processing and characterization of a new laterite soil ceramic for application in civil construction

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The civil construction sector conducts research to make its activities more sustainable and economical. Research is being carried out to develop and employ new materials and processes that meet environmental and socioeconomic sustainability criteria without reducing the reliability and durability of existing materials and processes. In this context, there is laterite, which is abundant in various geographic regions and has been widely used for centuries in the history of civil construction. The objective of this work was to process and characterize a new ceramic based on laterite soil and obtain a standard of test specimens with properties that can be used as a low-cost material in civil construction, designing and producing a new product within ABNT standards that can meet market demand. The processing of laterite samples was carried out by crushing the soil clods to a particle size of 45 mesh, and the samples in the form of pastille were obtained with a load of 1.5 ton/cm². The pastilles were subjected to different sintering processes, using a 100 °C interval, starting from room temperature up to 600 °C. The results of the TG and DSC thermal analyses showed thermal stability after 600 °C and two endothermic peaks, the first related to the transition of gibbsite and nacrite phases to form the kaolinite phase, and the second endothermic peak is associated with the dehydroxylation of kaolinite. The MEV results showed excellent sample homogeneity through micrographs, and the decrease in porosity as a function of temperature, with EDS making it possible to identify the presence of Fe oxide and Al in higher concentration in the samples. X-ray diffraction results showed the transition of gibbsite and nacrite phases to form the kaolinite phase and the transition of kaolinite, which after undergoing dehydroxylation, transformed into metakaolinite with an amorphous structure. The sample exhibited polymorphic behavior between temperatures of 200°C and 300°C. These results showed that the new lateritic soil ceramic has great potential to meet the demand of the civil construction market.