

Firing behavior of the clays used in the clay-based ceramic production

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The most common type of clay used in clay-based ceramic production e.g., tile, sanitary ware, and tableware is sedimentary origin i.e., “ball clay” that is composed primarily kaolinite accompanied by one or more of the mica-minerals such as illite, chlorite, and montmorillonite. The common clays used in pottery and brick production contains a large amount of illite and little amount of kaolinite. The ball clay and common clay may also contain varying amounts of smectite. The residual kaolin i.e. china clay used in the production of sanitary ware and tableware is well dressed and may contain very low amounts of illite-mica and other oxide impurities and has high crystallinities degree. The natural and industrial mixes of these three main clay classes; i.e., kaolinite, illite, and smectite groups are used together with feldspar and quartz minerals in clay-based ceramic production. The high-temperature phases of relatively pure clays of these three classes have been studied extensively and documented in the literature. The natural and industrial mixtures. i.e., the complex mineralogical composition of the green body makes the high-temperature phases and related physical properties of the fired body complicated and poorly reliable predicting. This work aims to summarize our knowledge about the high-temperature phases and formation sequence in clay-based ceramic bodies derived from the main three classes; i.e., kaolinite, illite and smectite and provides a reliable predicting model for the mineralizing processes taking into account results natural and industrial of mixture of these clay classes used in production . The main intrinsic characteristics e.g., crystallinity degree of kaolinite minerals in kaolinitic clays and the chemical composition of octahedral layer and interlayered cations of illite and smectite minerals have major importance in high-temperature phase formation and formation sequence. The different phases and formation sequences are observed between the ball clay and china clay, between cheto and wyoming type of smectite, between biotite with muscovite type of illite. Besides , the alkaline and earth alkaline elements contents and their concentration gradients and diffusion rates are also major importance newly-formed phases of clay based ceramic bodies.

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