PHASE TRANSFORMATIONS AND RELATED LIQUID PHASE PHYSICAL PROPERTIES: EVOLUTION DURING THE VISCOUS FLOW SINTERING IN PORCELAIN STONEWARE TILES

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The viscous flow sintering of porcelain stoneware tiles involves a complex evolution of both phase composition and chemistry of the liquid phase. The formation of an abundant liquid phase during sintering is a process that must be kept under strict control to achieve the desired properties of final products and prevent defects induced by pyroplasticity. This is particularly true for the production of large tiles, which requires uniform densification and minimal deformations at high temperature. In this work, five body formulations (mainly sodic or potassic and mixed Na-K), consisting of a mixture of ball clay, quartz and feldspars, were investigated. Samples were characterized by isothermal and constant rate optical TDA (hot stage microscope) and quantitative XRPD (Rietveld method), on quenched specimens. In the initial stage of sintering, the main transformations are the breakdown of clay minerals with the formation of amorphous components and mullite. In the intermediate stage the sintering is governed by the abundant liquid phase and by its physical properties. In the final stage a decreasing of densification rate is contrasted by a coarsening mechanism; a crucial role is probably played by changes in the solubility of solids and gases in the liquid phase.