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In this work, sintering behavior of tricalcium phosphate ceramics under the effect of an external electrical field (in Flash sintering configuration) was analyzed to obtain dense bio-resorbable components. The aim was to understand whether the application of the external E-field, which allows to reduce drastically sintering time and temperature, limits also the undesired β→α-TCP phase transition.

TCP powders were synthesized by solid state reaction and by wet synthesis though precipitation from aqueous solutions, this allowing to obtain amorphous calcium phosphate nano-particles, which were crystallized into nano β-TCP by thermal treatment. Then, cold-pressed green pellets were prepared and their sintering behavior was studied by dilatometry under different E-field at constant rate heating. The presence of α-TCP and the microstructure were investigated by XRD and SEM techniques.

It is shown that a Flash phenomenon takes place for both TCP powders morphology below 1000°C it being more evident at higher E-fields and when smaller particles were used. Moreover, although β→α transition occurs at ~1150°C for pure TCP, the detection of both polymorphs indicates a local higher temperature, which could be correlated to Joule effect induced by the current flow along the material.