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What we should consider to obtain fully dense ceramics

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Full densification is the primary goal of sintering for most ceramic materials and components. Full densification of a powder compact must be achieved if the isolated pores do not contain insoluble gases and if pore/boundary separation stemming from grain growth does not arise during sintering. Therefore, selection of sintering atmosphere and suppression/control of grain growth are critical for achieving full densification.

This presentation presents general directions for the full densification of powder compacts. We initially review the effects of entrapped gases on densification. We will describe the classical theory of microstructural evolution during sintering and its limitations. We will explain unconventional sintering processes that can reduce the grain growth kinetics relative to the densification kinetics and the possibility of pore/boundary separation. Pore/boundary separation (pore entrapment) is prone to occur intensively when abnormal grain growth (AGG) takes place. Possible strategies by which to suppress AGG and to control grain growth in general will be presented according to the mixed mechanism principle of microstructural evolution, which we established a decade ago.¹⁻³

References:

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