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Shape distortion and thermo-mechanical properties of SOFC components from green tape to sintering body

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Shape distortion and thermo-mechanical properties of SOFC components from green tape to sintering body.

Summary :

Sintering in ceramic materials is a critical process, especially when these are shaped as multilayer. From the green stage to the densification, the effects of organic additives removal, solid state diffusive phenomena, and either differential expansion or contraction of the layers can have critical effect on the final shape leading also failure, delamination etc. In this work, a tape-cast bi-layer structure for CGO and YSZ-(Sc) was studied during the thermal processing from debinding to the sintering. The bilayered samples undergo to several phenomena of shape instabilities and deformation due to binder burn out, differential shrinkage behavior and to a potential interfacial reaction between the two materials. To analyze the phenomena, shrinkage of SOFC components single layers and bilayered samples were measured in-situ by optical dilatometer. The densification mismatch stress, due to the strain rate difference between materials, was calculated using Cai's model. Camber (curvature) development for in situ co-firing of a bi-layer ceramic green tape has been investigated. Analysis of shape evolution from green to sintered body can be carried out by the thermo-mechanical analysis techniques.

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