Effect of spherical porosity on co-fired dense/porous zirconia bi-layers cambering

Geometrical instability leading to cambering is recorded during co-sintering of zirconia dense/porous bi-layered planar structures. Sintering strain in the bi-layers rises mainly from mismatch between the different porosity volume fractions at the layers and their interface. In this paper, we analyze the model case of dense taped of 8 mol% Y$_2$O$_3$-stabilized ZrO$_2$, laminated on ca. 400 μ thick 3 mol% Y$_2$O$_3$ doped zirconia porous tapes, with homogenous spherical porosity of 13 vol%, 46 vol%, and 54 vol%. Sintering stress during densification is evaluated from the shrinkage rates and viscoelastic behavior during sintering by thermo-mechanical analysis, using cyclic loading dilatometry. The camber development of the bi-layers is measured by in-situ optical dilatometry. In accordance with the model prediction, cambering can be controlled tuning the porosity while achieving a synergetic effect between densification and formation of open porosity at the bilayers.