

Monitoring of Sintering With and Without Shrinkage via the Impulse Excitation Technique (IET)

Willi Pabst^{1, S, C} and Eva Gregorová¹

¹*UCT Prague (University of Chemistry and Technology Prague), Prague 6, Czechia
pabstw@vscht.cz*

Sintering is usually accompanied by densification and shrinkage, but not always. There are cases, e.g., tin oxide ceramics, where sintering occurs without densification and shrinkage, because only non-densifying sintering mechanisms are active (surface diffusion and / or evaporation-condensation). In these cases traditional methods like dilatometry are clearly not suitable for monitoring the degree of sintering. Nevertheless, despite the absence of densification and shrinkage, the effective properties can change significantly during sintering, just because of the growth of sinter necks and the concomitant changes in the particle shape and / or connectivity. The impulse excitation technique (IET) is an ideal method for monitoring the changes in elastic properties, e.g., Young's modulus, as a function of temperature. In the present contribution we compare the microstructural evolution of ceramics with and without shrinkage on the basis of Minkowski-functional-based descriptors (porosity, interface density, mean curvature integral density, and total curvature integral density) and using computer simulations we explain how the elastic properties depend on these descriptors. Real-world measurements using the IET are then interpreted in terms of changes in these microstructural descriptors.