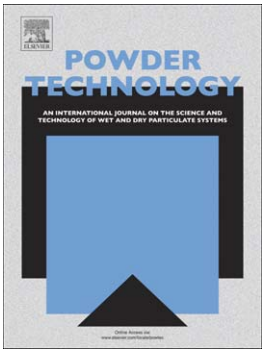

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Spark plasma sintering and complex shapes: The deformed interfaces approach

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Keywords

Spark plasma sintering, complex shape, simulation, powder compaction, sacrificial material

Abstract

Over the last few decades, the SPS technique has proven its benefits in terms of microstructure control, reduction of cycling time and a general stability of the results. However, to overcome the so-called "valley of death" between fundamental research and successful industrialization, the next step is to prove the ability of this technology to perform the total densification of highly complex shape samples. The elaboration of complex shapes with die compaction processes often present densification inhomogeneity because of the thickness differences of the sample. In this paper, we present a method to solve this problem with an approach we called the "deformed interfaces method" that uses sacrificial materials. This method can be generalized to all the pressure assisted sintering techniques and allow a complete densification whatever the shape complexity of the part. This method is tested with different materials (Al, CoNiCrAlY, PMMA, Al_2O_3, 4Y-ZrO_2) and shapes. To prove the effectiveness of this method on very high complex shapes, a 98% dense turbine blade shape has been made.

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