

Expanding the Limits of Flash Sintering Through a Contactless, Plasma Based Approach

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Flash sintering enables rapid ceramic densification at reduced furnace temperatures, but its use is limited by electrode degradation and scaling constraints. We present a contactless flash sintering (CFS) platform that replaces physical electrode with a plasma based charge transfer mechanism integrated with real time electrical control and robotic rastering. Tape cast coatings of 8YSZ, $\text{Y}_2\text{Si}_2\text{O}_7$, Al_2O_3 , and ZrB_2 were selected to span a wide range of electrical and thermal properties. YSZ coatings show rapid densification and uniform microstructures under CFS. $\text{Y}_2\text{Si}_2\text{O}_7$ also densifies but develops cracks and isolated voids after full consolidation, potentially related to volatilization of silica rich phases; this mechanism remains under investigation. Al_2O_3 shows very limited flash induced densification under comparable conditions. An inert atmosphere configuration enables CFS of oxidation sensitive ceramics, and preliminary ZrB_2 flash sintering behavior will be presented. These results clarify material dependent responses in contactless flash sintering and support its extension to diverse ceramic systems.

Professional Status of the Speaker

Senior Scientist

Interest in submitting a paper in a special issue of

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No

Author: Dr ZHANG, Zhao (Lucideon M+P)

Co-authors: Mr KUPFERBERG, Andrew (Lucideon M+P); Dr GRIMLEY, Carolyn (Lucideon M+P); Dr GREEN, Christopher (Lucideon); Dr MCGARRAHAN, John (Lucideon M+P)

Presenter: Dr ZHANG, Zhao (Lucideon M+P)

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