

Flash Sintering of B₄C: simulation and experimental testing

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B₄C is a hard ceramic material that is used for armor protection and nuclear reactor walls. However, it is difficult to fully densify due to its strong covalent bonding; therefore, techniques that employ high temperatures (>2000 °C) and pressure are often used, namely Hot Pressing or Hot Isostatic Pressing. Nonetheless, these techniques require high energy consumption and take a considerable amount of time to fully densify this material. New and faster sintering techniques have been developed in the last decades to densify materials in much shorter time and with lower energy input, as the Electric Current/Field Activated/Assisted Sintering (ECAS/EFAS) techniques, which employ an electric field and current to generate internally heat by Joule effect. Flash Sintering (FS) is a recent technique from this group that is more directed toward semiconductors, as is the case of B₄C, typically enabling materials to sinter within few minutes, under the condition of the flash event occurrence with generation of enough Joule heating. In this work, the Joule effect on a B₄C sample will be simulated by Finite Element Modelling (FEM), by varying the voltage and current, at 500°C surrounding temperature, with the intent of estimating the attained sample temperature. The simulated results were compared with FS experiments and used to select the FS parameters able to sinter B₄C and B₄C-10 Ni (vol%) samples. The sintered samples were physically, structurally and microstructurally characterized.

Professional Status of the Speaker

Doctoral or Master Student

Interest in submitting a paper in a special issue of

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Invitation letter for visa

No

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