

FLASH SINTERING OF ARMOR MATERIALS: CHALLENGES AND OPPORTUNITIES

Andrew Rosenberger, ORAU
andrew.rosenberger3.ctr@mail.mil
Raymond Brennan, ARL
Michael Kornecki, SURVICE
Selva Vennila Raju, ORAU
Aubrey Fry, ORISE

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Flash sintering has been found to enable rapid densification of a wide range of ceramics at lower processing temperatures and shorter times than conventional sintering. This is of particular interest for materials that are difficult to conventionally sinter, including those used in ceramic armor systems, such as B₄C, SiC, and B₆O. However, the driving mechanisms behind flash sintering are still hotly debated, and the interactions between the processing parameters and the materials being sintered are only in the early stages of being explored. Furthermore, there has been little documented effort to flash sinter these materials and characterize the process. The Army Research Laboratory strategy for research on flash and field-enhanced sintering of ceramics is described, with particular focus on the challenges and opportunities for sintering boron carbide and other relevant armor materials. The design of a scalable flash sintering apparatus and the observed effects of various process parameters such as contact mechanism, atmosphere, current/voltage profile, and part shape as they relate to flash and densification behavior are discussed.

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