

US-Japan Joint Development for Advanced Energy Applications

C.A. Lewinsohn, J. Fellows, and M. Wilson, Ceramatec, Inc., Salt Lake City, UT, USA.

T. Hinoki, Institute for Advanced Energy, Kyoto University, Kyoto, Japan.

H. Serizawa, Joining and Welding Research Institute, Osaka University, Osaka, Japan.

Joining is an enabling technology for application of high temperature ceramics in advanced energy applications. From gas turbines and heat-exchangers to fusion reactors, ceramics offer potential gains in operating efficiency that can reduce power generation costs and reduce emissions. This work will review efforts to develop new joining methods to address the limitations of conventional approaches. These efforts have led to methods for fabricating gas-tight joints at temperatures that do not cause creep in complex components. The mechanical properties of different joining methods will be compared, and the effects of exposure testing will be discussed. Application of these approaches to the fabrication of microchannel, microreactors will be discussed. The talk will describe generic approaches and issues related to joining ceramics to themselves and how challenges have been addressed by collaborative efforts combining experimental and theoretical methods. Other technical applications, including heat exchangers and fuel cells for energy conversion, that can benefit from application of the experience and capabilities that have been developed, will be discussed.