CERAMIC-METAL JOINING FOR AUTOMOTIVE CERAMIC ENGINES, Shinhoo Kang, Dept. of Inorganic Materials Eng. Seoul Nat'l Univ., Seoul, Korea

Joining ceramics to metals has become a necessity as the use of structural ceramics such as silicon nitride and silicon carbide broadens. Especially for the success of ceramic heat engine applications, joining a ceramic rotor to a metal shaft is being regarded as a key technology. The major problems in joining two dissimilar materials are (1) stress development at ceramic-metal interface, (2) the compatibility among the joint components during processing, and (3) high-temperature creep resistance and impact resistance of the joints. Of various joining techniques, brazing was a method of choice due to its superb tolerance for processing and excellent capability in stress accommodation.

In this study, a general methodology was developed for Si_3N_4-Incoloy 909 joint to meet the 650°C application temperature. This includes (1) the development of material system consisting of coating, intermediate layer, and braze alloys, (2) finite element analysis (FEA) for the design of the joint geometry and (3) prediction and verification of the joint strength and joint life. An effort was made to understand the interaction at the ceramic-metal interface and its effect on the performance of the joint. Approach for the design of high-temperature braze will be also discussed .

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