

13TH INTERNATIONAL CONFERENCE ON
ADVANCED MATERIALS AND NANOTECHNOLOGY
OCTOBER 26-28, 2017 OSAKA, JAPAN

Joining of SiC_f/SiC using preceramic polymers

Dong Hyuk Jeong, Pipit Fitriani, Amit S Sharma and Dang-Hyok Yoon
Yeungnam University, Republic of Korea

SiC_f/SiC possesses great potential for applications in severe conditions, including high temperatures and structural components for future fusion reactors. Various fabrication techniques have been developed to fabricate SiC_f/SiC, which generally produce simple shape, such as plates and tubes. However, their practical utility can only be realized by integrating simple shapes into complex geometries. Therefore, considerable research efforts are being directed to develop filler materials, which can be employed to join SiC_f/SiC. However, SiC-based fillers being similar to the SiC_f/SiC joining body are a natural choice to preserve the outstanding properties of SiC_f/SiC. Taking this into consideration, we tried to obtain pure SiC joining filler by pyrolyzing the preceramic polymers, such as Polycarbosilane (PCS) and Polysilazane (PSZ). Both of PCS and PSZ were applied in a paste form followed by thermal treatment, where SiC was the main products along with the presence of small amount of Si₃N₄, depending on the starting material. Because cracks and pores might be generated by the vaporization of gaseous products, which can hamper the overall joining properties, careful optimization for the polymeric composition, choice of filler, heating rate, joining temperature and pressure was performed. A slow heating rate of 2 °C/min was employed for the temperatures of 1600-1700 °C to obtain sound and crack-free joints, while the pressure of 3.5 and 20 MPa was applied. The joining strength was estimated by 3-point bending test and correlated with the interfacial microstructure, mode of failure as well as the joint thickness.

Biography

Dong Hyuk Jeong is pursuing his graduation from the School of Materials Science and Engineering at Yeungnam University, Republic of Korea. His current research is on the joining of SiC_f/SiC for high temperature and nuclear reactor applications.

cdh2090@ynu.ac.kr

Notes: