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Oxidation behavior of ZrB₂-SiC-ZrC in oxygen-hydrogen torch environmentYuki Kubota^{a*}, Mamoru Yano^b, Ryo Inoue^b, Yasuo Kogo^b, and Ken Goto^c^a Japan Aerospace Exploration Agency, Structures and Advanced Composite Research Unit, 181-0015, Japan, Tokyo, Mitaka-shi, Ohsawa, 6-13-1^b Tokyo University of Science, Department of Materials Science and Technology, 125-8585, Tokyo, Katsushika-ku, Nijyuku, 6-3-1^c Japan Aerospace Exploration Agency, Institute of Space and Astronautical Science, Kanagawa, Sagami-hara, 252-5210, Chuo-ku, Yoshinodai, 3-1-1*Corresponding author: kubota.yuuki@jaxa.jp

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Abstract

The oxidation behavior of four ZrB₂-SiC-ZrC compositions with varying ZrC contents (20, 34, 50, and 64 vol.%) was compared to that of ZrB₂-SiC. The ceramics were oxidized at 1700°C in an oxygen-hydrogen torch environment. The liquid oxide on the ZrB₂-SiC sample came off from the surface under such an environment. In contrast, the all ZrB₂-SiC-ZrC samples maintained the convex oxide on the surface, which consisted of ZrO₂ and SiO₂. The convex oxide of ZSZ with higher ZrC content was thicker, with the exception of ZrB₂-SiC-64vol.%ZrC sample. The ZrB₂-SiC-64vol.%ZrC sample formed a ZrO₂-rich layer, which was clearly denser than the ZrO₂-SiO₂. This densification was caused by ZrO₂-sintering, and it was specific behavior under the dynamic pressure.

Keywords: Ultra-high temperature ceramic, ternary system, ZrB₂-SiC-ZrC, oxidation under dynamic pressure, oxygen-hydrogen torch

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