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Steam oxidation of SiC at high temperatures studied by laser heating method

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Silicon carbide (SiC) has recently attracted much attention as a potential material for accident tolerant fuel cladding. To investigate the performance of SiC in severe accident conditions, study of steam oxidation at high temperatures is necessary. However, the study focusing on steam oxidation of SiC at temperatures above 1600°C is still certainly limited due to lack of test facilities. With the extreme oxidation/corrosion environment in steam at high temperatures, conventional refractory materials, i.e., alumina, zirconia, W, Mo and so on, would not survive during the tests. Application of laser heating technique could be a great solution for this problem. Using a laser heating technique, we can localize the heat transfer and focus them on the test sample only. This paper presented the outline of the laser heating facility and recent results on high-temperature oxidation of SiC in steam in temperature range between 1400 and 1800°C (for 1-7 h). The oxidation kinetics is then discussed based on the weight gain and observation on the cross-sectioned surface of tested samples. Mechanism of bubbling observed in our samples above approximately 1750 °C is also discussed.

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