STRESS-RUPTURE OF A Nextel™ 720 FIBER-REINFORCED OXIDE MATRIX COMPOSITE: THE ROLE OF EVOLUTION OF FIBER MICROSTRUCTURE[1], Edgar Lara-Curzio and K. L. More, Metals & Ceramics Division, Oak Ridge National Laboratory, Oak Ridge, TN 37831-6069

The stress-rupture behavior of a continuous Nextel™ 720 fiber-reinforced alumino-silicate oxide matrix composite was studied at 1200°C in ambient air. It was found that the time-to-failure of the material ranged between 4 and 1018 hours for tests conducted at 100 MPa and 50 MPa, respectively and that the strength of the composite decreased with time as $t^{-0.125}$. By recording the strain during the tests it was found that the strain rate reached a minimum value and that it was related to the test stress as

$$\dot{\varepsilon} = 4.3 \times 10^{-7}\ \sigma^{5}$$

Transmission electron microscopic analysis of the composite before and after the tests indicated that the alumina grains in the fiber grew with time from average dimensions of 85 nm x 24 nm for the as-received fibers to average dimensions of 131 nm x 55 nm after 1018 hours at a composite stress of 50 MPa. It was found that a combination of the kinetics of the alumina grain growth and Griffith's criterion agrees well with the time-dependency of the loss of strength of the composite during stress-rupture.

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