Oxidation Performance of Ultra-high Temperature Ceramics in Air and a Simulated Combustion Environment

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The oxidation resistance of various (Zr or Hf)B2-based ceramics will be tested in order to evaluate their respective performances in both furnace and oxyacetylene torch environments. Furnace testing will allow experimentation at temperatures similar to hypersonic travel or reentry conditions (>2000°C); use of an oxyacetylene torch flame will enable the replication of severe thermal gradients and combustion conditions. Oxidation resistance will be firstly quantified by measuring a sample's change in mass after exposure to the testing environment for a defined time period. A sample that experiences a smaller change in mass is better able to resist oxidation. Oxidation rate will also be calculated by measuring post-test oxide scale thickness, as well as erosion depth when applicable. Oxyacetylene torch tests are expected to yield larger oxidation rates than furnace testing due to the harsher testing environment, allowing for a more in sightful selection of superior materials.

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