View Abstract

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CURRENT SYMPOSIUM: SYMPOSIUM 18: Ultrahigh-Temperature Ceramics

CURRENT SESSION: Bulk ceramics, thin films, coatings, fibers, and composites

PRESENTATION TYPE: Contributed (Oral)

TITLE: Oxidation behavior of Nb coatings on ZrB_2

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ABSTRACT BODY:

Abstract Body: The demand for more efficient materials at elevated temperatures is ever-increasing and the availability of such materials is scarce. ZrB_2 is a member of the family of Ultra High-Temperature Ceramics (UHTCs). ZrB_2 has unusual properties such as extremely high melting point, strength, thermal conductivity, elastic modulus and a low theoretical density, which makes itself very attractive for applications in hypersonic vehicles, aero-propulsion and more. However, the oxidation properties above 1500°C limit the use of ZrB_2 under oxidizing conditions. Various studies have shown that the addition of transition metals improves the oxidation behavior of ZrB_2 at higher temperatures. This approach can compromise the mechanical and thermal properties of the resulting ceramics. This study focuses on the application of Nb metallic coatings by means of magnetron sputtering to improve the oxidation resistance of ZrB_2. The oxidation studies were performed at 1500°C in a tube furnace under different atmospheres for 1h, 4h and 10h exposure times. The influence of a pre-annealing (under vacuum) on oxidation behavior was also investigated. The Nb metallic coatings have shown promising results and reduced the oxide scale growth compared to uncoated ZrB_2. The formation of mixed Nb and Zr oxides at the surface has reduced the oxygen transport at the ZrB_2 reaction front by a grain refinement. The pre-annealing improved the beneficial effects of the coatings.

KEYWORDS: UHTC´s, ZrB2, Nb coatings.

Presenter Acknowledgment: I have read and acknowledge the above paragraph

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