

## عنوان مقاله:

Oxidation Behavior of HfB<sub>2</sub>-SiC-Nd<sub>2</sub>O<sub>3</sub> Ultra-High Temperature Composite Sintered through SPS Process

## محل انتشار:

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## خلاصه مقاله:

The current study aims to fabricate HfB<sub>2</sub>-۳۰ vol. % SiC and HfB<sub>2</sub>-۳۰ vol. % SiC-۲ vol. % Nd<sub>2</sub>O<sub>3</sub> composites through Spark Plasma Sintering (SPS) method at ۱۹۵۰ °C for ۱۰ min. The oxidation behavior of the prepared composites was investigated at ۱۴۰۰ °C and different times namely ۴, ۸, ۱۲, and ۱۶ hours. The relative density, hardness, toughness, and strength of the HfB<sub>2</sub>-۳۰ vol. % SiC composite increased from ۹۸.۵ %, ۲۰.۱۹ GPa, ۴۱۴.۹ MPa, and ۴.۳۶ MPa.m<sup>۰.۵</sup> up to ۹۹.۱ % , ۲۴.۴۷ GPa, ۴۸۵ .۵ MPa, and ۴.۹۳MPa.m<sup>۰.۵</sup> for HfB<sub>2</sub>-۳۰ vol. % SiC-۲ vol. % Nd<sub>2</sub>O<sub>3</sub> composite, respectively. After ۱۶ hours of oxidation, SiO<sub>2</sub> layer, which was extremely thick, was produced locally on the oxidized HfB<sub>2</sub>-۳۰ vol. % SiC composite surface. The thickness of the SiO<sub>2</sub> layer was calculated to be around ۲۵ μm. The thickness measurement revealed the SiO<sub>2</sub> produced layer on the surface of the HfB<sub>2</sub>-۳۰ vol. % SiC-۲ vol. % Nd<sub>2</sub>O<sub>3</sub> composite to be ۵ μm. The oxidation kinetic results of the composite exhibited linear-parabolic behavior. The chemical reaction during the oxidation process controlled the oxidation rate after eight hours. After ۱۶ hours of performing the oxidation procedure at ۱۴۰۰ °C, HfB<sub>2</sub>-۳۰ vol. % SiC-۲ vol. % Nd<sub>2</sub>O<sub>3</sub> composite exhibited parabolic behavior, while HfB<sub>2</sub>-۳۰ SiC exhibited linear behavior. This composite's improved oxidation resistance was attributed to Nd(Hf,Si)OxCy phases and decreased porosity, resulting in the generation of thin, dense, adherent, and protective layers. Therefore, it was concluded that the oxygen diffusion rate could control the oxidation process in HfB<sub>2</sub>-۳۰ vol. % SiC-۲ vol. % Nd<sub>2</sub>O<sub>3</sub> composite.

## کلمات کلیدی:

HfB<sub>2</sub>-SiC-Nd<sub>2</sub>O<sub>3</sub> Composite, Oxidation behavior, Spark Plasma Sintering, Rare earth element

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