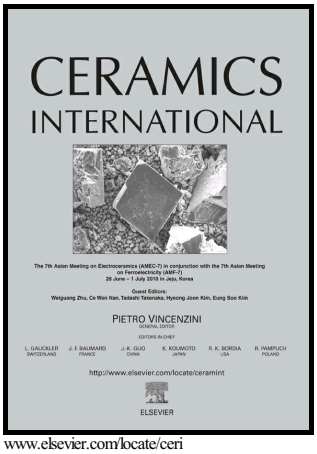

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Preparation and properties of a novel precursor-derived Zr-C-B-N composite ceramic via zirconocene and borazine

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Abstract：A novel preceramic polymer polyzirconocenyborazane (PZCBN) was synthesized by the polymerization of Bis(cyclopentadienyl)zirconium divinyl and borazine, introducing Zr, B, C, N together. The formation and concentration of elements Zr, C, B, N in the precursor and ceramic were detected through FTIR, NMR, XRD, SEM and TEM. From the analysis, the $Cp_2Zr(CH=CH_2)_2$ and borazine linked together via the addition reaction between C=C and B-H. And after pyrolysis at 1200 ^oC, the precursor turned to ZrC/ZrB_2/BN composite ceramics, with a yield of 52wt%. EDX resulted showed that the elements were well dispersed in the ceramics. According to SEM and TEM, the ceramic had a relatively dense structure with nano crystalline areas of ZrC embedded in the amorphous Zr-C-B-N matrix. TGA in air demonstrated that the ceramic had a favorable property on oxidation resistance.

Keywords: ultra high temperature ceramics; precursor; element dispersion; composite ceramic; oxidation resistance

1. Introduction

The precursor-derived ceramics (PDCs), with the controlled pyrolysis of organometallic polymers, is well developed to produce structural and functional ceramics[1-3]. They have attracted remarkable interest in the last twenty years because of their improved properties and ability to be transformed into diverse shapes, such as fibers, highly porous components, and composites[4,5]. Numerous polymers