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Oxidation and Mechanical Properties of ZrB2-based Mixed Boride

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Transition metal boride characterized by high melting points, high mechanical properties and relatively good oxidation resistance in extreme environments. This family of ceramic materials has come to be known as Ultra High Temperature Ceramics(UHTCs). In this materials family, ZrB2 has the lowest theoretical density, which is combined with high electrical and thermal conductivities. This unique combination of properties makes ZrB2-based ceramics attractive for aerospace and other applications such as high-temperature electrodes, and crucibles for molten metal, hypersonic aerospace vehicles and re-usable atmospheric re-entry vehicles. These days, a matter of common interest in UHTCs is improvement of oxidation resistance by adding SiC. Besides SiC, additives such as MoSi2, ZrSi2 improve the oxidation resistance of diborides either alone or in combination with SiC.

In this study, the mechanical and oxidation properties of adding other transition metal boride(TaB2, NbB2) will be discussed.

Keywords: ZrB2, oxidation behavior, mechanical properties

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Plasticity improvement of a bulk amorphous alloy based on its viscoelastic nature.

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This study examined the fundamental issue of whether an elastic shear stress imposed on an amorphous alloy causes structural changes during the process of quasistatic loading. In order to deliver the elastic shear stress to the workpieces, a quasistatic shear deforming device was designed. With repeated application of elastic shear stress, the plasticity of the shear-deformed amorphous alloys increased, while the yield strength decreased. These behaviors were analyzed from the perspective of the structural changes associated with the viscoelastic nature of amorphous alloys.

Keywords: Bulk amorphous alloy, Plasticity, Free volume, ECAP