NOVEL ENTROPY–STABILIZED ULTRA HIGH TEMPERATURE CERAMICS THIN FILMS PREPARED BY MAGNETRON SPUTTERING

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The entropy stabilization concept recently has been successfully applied to oxides and borides of transition metals, and induce the great interest especially in the case of ultra-high temperature application. These materials typically are a single-phase mixture of 4 or 5 elements in equiequiatomic proportions.

Here we show the new thin film ceramic system $(Hf_{1/4}Zr_{1/4}Y_{1/4}Ce_{1/4})\ O_{2-\delta}$ which exhibit superior thermal stability up to 2000°C. Films were prepared by the reactive magnetron sputtering using two metallic HfZr and YCe targets in $Ar+O_2$ atmosphere. Sputter deposition we performed at room temperature and 500°C. We show relationships between sputtering parameters such as magnetron power density, total pressure, gas mixture and properties of produced film such as mechanical properties, density, phase evolution and thermal stability. We determine the sputtering parameters "window" were sputtered films are characterized by the single-phase cubic structure.

We use thermogravimetry measurements in order to characterize thermal properties of studied films. Also we have studied the role of the fifth element addition with different crystal structure (MgO) on the entropic stabilization of the coatings.

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