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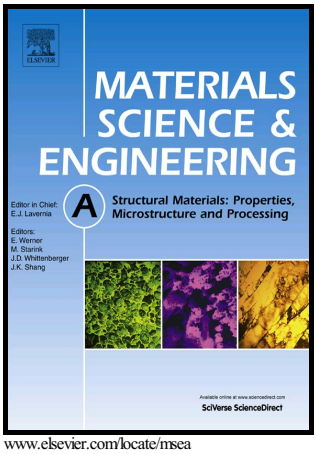

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Elastic and plastic properties of as-cast equimolar TiHfZrTaNb high-entropy alloy

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Abstract

Elastic properties of as-cast TiHfZrTaNb high entropy alloy were investigated by ultrasound measurements, yielding $G = C_{44} = 28$ GPa and $C_{11} = 172$ GPa effective isotropic elastic constants, allowing computation of the Young's modulus E, the bulk modulus B and Poisson ratio ν of about 78.5 GPa, 134.6 GPa and 0.402, respectively. A Pugh ratio G/B as lower as 0.208 and high positive Cauchy pressure $(C_{12}-C_{44}) = 80$ GPa were calculated, suggesting a ductile behavior. Tensile tests were carried out on specimens taken along the ingot diameter to address micro-segregations effect on the macroscopic behavior. More specifically, micro-segregations were addressed at a smaller scale via nanohardness measurements. Given the observed low deviations from both tensile and nanoindentation experiments, micro-segregations influence was concluded to be negligible. The necking and fracture surface investigations revealed multiples slip bands, grains boundary distortions, mixture of shallow and profound