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Mechanical properties of Ti 50−xHfxPt50, (0 < x < 50) for HTSMAs applications

Shape memory alloys (SMAs) are metallic materials that can revert to their original shape when exposed to various temperatures. These materials are used in applications such as actuators and aerospace due to their remarkable properties shape memory effect and pseudo-elasticity which occurs as a result of phase transformation. TiPt undergoes a reversible martensitic transformation from B2↔B19 at higher temperatures. Previous studies showed that the TiPt alloy is mechanically unstable with the negative C′ (−32) and soft modes in the negative frequency of the phonon dispersion curves along the gamma region at 0 K. The supercell approach was used to substitute Ti with Hf on TiPt structure to evaluate their mechanical stability from elastic properties and the phonon dispersions curves. The elastic properties suggest that an increase in Hf concentration enhances the mechanical stability of ternary systems. The C'; becomes positive and larger at 25 < x < 50, which suggests a reduced martensitic transformation at x ≥ 43.75. The Ti 50−xHfxPt50 systems becomes more ductile with the increase in Hf concentration, which suggests that Hf stabilizes the system at a higher concentration. The analyses of the vibrational properties of Ti50−xHfxPt50 structures with respect to phonon dispersion are also discussed.

Apply to be considered for a student ; award (Yes / No)?

No

Level for award;(Hons, MSc, PhD, N/A)?

N/A

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