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The development of Ti-Pt-V shape memory alloys using both computational modelling and experimental techniques

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There is currently a high demand for the development and commercialisation of TiPt based shape memory alloys (SMAs). The development of these SMAs involves both computational modelling and experimental techniques. The integration of both techniques provide a detailed interpretation of the results that cannot be achievable using only the experimental approach. Therefore, this study uses first principles computational modelling and experimental techniques in the development of Ti-Pt-V alloys. Titanium (Ti)-based alloys are considered to be the most attractive metallic materials for aerospace and automobile applications. In this regard, the TiPt alloys are the most promising SMAs for high temperature application due to their transformation temperature of above 1000 0C. However, the binary alloys have been found to be mechanically unstable and exhibit very low shape memory effect, which is attributed to low critical stress for slip deformation compared to the stress required for martensitic transformation. Therefore, the addition of alloying elements has been suggested as one of the ways to improve the mechanical properties of TiPt alloys. In this study, the addition of 6.25 and 12.5 at.% vanadium (V) to replace either Ti or Pt was used. It was observed that both approaches were in good agreement wherein the replacement of Ti with V increased the martensitic transformation temperature of the TiPt alloys. However, the reverse was observed with the replacement of Pt with V.

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No

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N/A

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