Characterization of the tension-compression behavior of the Fe-30Mn-6Si-5Cr Shape Memory Alloy

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Résumé

Iron based shape memory alloys are known for their special thermomechanical properties that can be exploited in innovative industrial applications such as high damping capacity systems. This great potential can’t be industrially exploited without the good knowledge and control of thermomechanical behavior under different conditions and in particular under different loading paths (tension, compression). In this paper, the tension and compression behavior of the Fe-30Mn-6Si-5Cr shape memory alloy has been studied under several conditions in order to bring out an optimization for damping purposes. In this context, cylindrical specimen cut by wire EDM (Electrical Discharge Machining) were tested using a tensile machine under several parameters. Temperature effect was studied from ambient to 200°C. Different microstructural states were investigated: purely austenitic state and biphased states (austenite + stress induced and/or thermal martensite). Furthermore, tension-compression cycles were realized at different loading rates for better behavior apprehension and specially the tension-compression asymmetry behavior. Finally, a specific heat treatment has been performed to ensure shape memory effect by enhancing martensitic transformation and improving martensitic transformation temperature points.

Mots-Clés: Iron Based Shape Memory Alloys, Compression behavior, Tension, Compression Asymmetry, Heat Treatment

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