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SHAPE CHANGE IN FERROMAGNETIC Ni2MnGa BY MARTENSITE VARIANT REARRANGEMENT AND TRANSFORMATION

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Ni2MnGa-based ferromagnetic shape memory alloys (FSMAs) are hoped to be used as robust actuation materialswith high performance and power-density, to replace other actuation materials such as thermo-mechanical SMAs and mechanical-electric piezoelectrics. Recently, we have observed significantly large strains for Ni_2MnGa-based FSMAs both in single- and poly-crystalline forms [1, 2]when they are placed under magnetic field. Two mechanisms have been proposed to predict the magnetic field-induced shape change at temperatures below M_f and above A_f as a function of external magnetic field. In the case of shape change taking place at temperatures below Mf, one pair of martensite variants are assumed to present and shape change is considered to be caused by rearrangement of such paired variants by the application of magnetic field. When temperatures are above A_f, on the other hand, martensite variants with preferred orientation are assumed to be induced by magnetic field and their magnetization occurs parallel to the direction of the applied magnetic field. In both cases, all possible energy terms have been taken into account and the field-induced shape change of Ni2MnGa can be explained as a function of magnetic field.

References

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