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MS26. Modulated, modular and composite materials

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MS26-P1 Systematical study of the structure of Ni₂MnGa single crystals by high-resolution x-ray diffraction reciprocal space mapping

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Ni₂MnGa is nominally cubic, however small deviations from exact 2:1:1 stoichiometry give rise to structural changes, leading to tetragonal or even monoclinic lattices. Up to now, the structure of Ni₂MnGa has been studied mostly by means of powder diffraction; in our work we performed a detailed study of the structure of Ni₂MnGa single crystals using high-resolution x-ray diffraction and reciprocal space mapping. Our samples were found monoclinic at room temperature and they exhibit large twinning domains detected from splitting of diffraction peaks in reciprocal space. Moreover, we found distinct satellite peaks at non-integer HKL positions demonstrating that the lattice structure is self-modulated along [110]. This modulation can be described by a harmonic displacement wave, the coefficients of which have been obtained from a numerical analysis of the integrated intensities of the satellite peaks. We performed an annealing study and found martensitic (monoclinic)/austenitic(cubic) phase transition at approx. 60°C with the hysteresis of about 10°C; the twinning and modulation peaks disappeared in the cubic (high-temperature) phase.

Keywords: shape memory alloy, reciprocal space mapping, twinning, modulated structure, high-temperature diffraction