

**EXPERIMENTAL INVESTIGATION OF HOMOGENEITY REGIONS
AND THERMODYNAMIC PROPERTIES OF G PHASE
IN QUATERNARY Ni-{Mn, M}-Si SYSTEMS (M = Fe, Ti, Cr, Nb)**

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G-phase (*cF116*, *Fm-3m*) is forming after prolonged operation in heat-resistant steels and is known to have a deteriorative effect on the strength characteristics of steels. Direct study of the chemical composition of the G-phase and equilibrium phase fraction at different temperatures is a rather rigorous experimental task due to the small particle size and low fraction of this phase in steels.

The aim of the current work was to establish the homogeneity range and phase equilibria during crystallization of the G-phase in the Ni-Mn-Si system. The study also aimed to determine the maximum solubilities of Fe, Ti, Cr, Nb in the G-phase originating from Ni-Mn-Si system. Thermodynamic properties, such as the standard enthalpy of formation and heat capacity, were experimentally investigated. Samples were obtained by arc-melting and analyzed in as-cast and annealed states using the SEM/EPMA, XRD, DSC, adiabatic calorimetry and drop-solution calorimetry.

This study demonstrates that the G phase in the Ni-Mn-Si system forms via congruent melting, and for the first time, phase equilibria during crystallization in the nickel-rich region were experimentally investigated. It was also demonstrated that, although Ti and Nb can completely replace Mn, Fe and Cr exhibit limited solubility in the G phase formed in the Ni-Mn-Si system.

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