

On the constitution and structural chemistry of T-Mn systems

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Manganese is one of the important alloying partners in a series of structural alloy systems with a Laves-phase as the dominant compound. Consequently, the T-Mn phase diagrams (T is an early transition metal from Sc to Ta, U) and the TMn₂ Laves phases are part of numerous ternary and higher order systems of technological importance, involving hydrogen storage materials, high strength steels (exceeding a yield strength of 700 MPa) and intermetallics in aerospace and/or earth-bound turbine applications and last but not least high strength materials for biomedical applications.

Based on our systematic investigations (phase relations, X-ray and neutron structure analyses, SEM, TEM and physical property studies) of binary and ternary Laves phase systems with Mn, the presentation will provide a comprehensive overview on (i) the structural chemistry of the corresponding Mn Laves phases, (ii) their thermodynamic stability from calorimetric measurements but also from DFT calculations, (iii) the phase relations in binary T-Mn systems including CALPHAD-type thermodynamic assessments, and (iv) evaluation of physical properties (resistivity, magnetism, specific heat) including also mechanical properties.